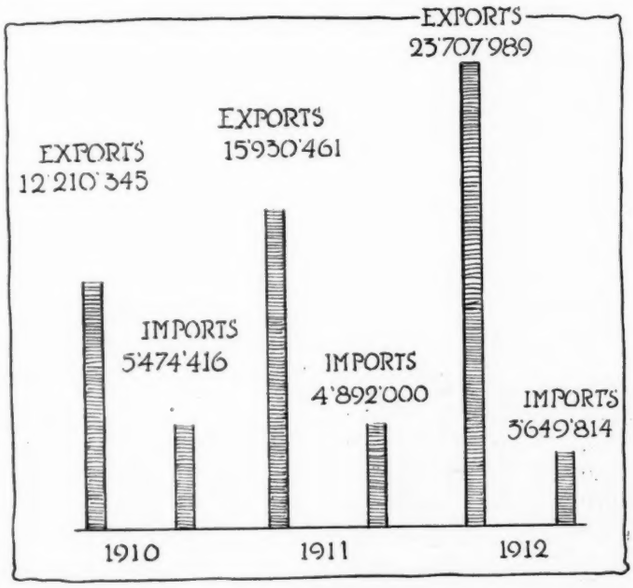
VOL. XXIX. NEW YORK—THURSDAY, OCTOBER 16, 1913—CHICAGO NO. 16.

The AUTOMOBILE

World's 1912 Automobile Exports $127,398,000

Value of Imports for That Year Totals $100,224,000—United States Ranks Second in Value of Exports and Fifteenth in Value of Imports

CONSIDERING the enormous output of the automobile concerns of the United States, whose individual production, in some cases, exceeds that of any country in Europe, it must be noted with a great deal of satisfaction that our export trade is quickly and surely climbing to first place. On the other hand, importations of automobiles and parts have been steadily dropping in value. In the past 2 years this country's export trade has doubled; at this rate it will only be a matter of a year or two until we have surpassed France, who now leads. Correspondingly, our consumption of foreign automobiles has been decreasing, the figure for 1912 amounting to $1,375,406, while the value of automobiles exported was seventeen times as much, or $23,703,989.



Graphic comparison of the relative value of exports and imports, of automobiles and parts, of the United States for the past 3 years, showing 100 per cent. increase of exports and 50 per cent. decrease in imports

Great Britain and her possessions take the bulk of automobiles exported from this country, using in 1912, $16,000,000 worth.

The increase of the export trade of the United States at such a rapid pace is due to a stronger demand for our product in the British Isles, Canada, British Oceana, and the countries of Asia and South America. Our best customer is Great Britain and her possessions, who took $16,000,000 worth, or about two-thirds the total.

Two items of especial interest are noticed on looking over the tabulation of Canada's foreign trade for the three years just passed: namely, the rapid growth of her export trade and the almost complete monopoly of the United States over the Dominion's imports. Our northern neighbor exports four times as many machines as she did 2 years ago, while her imports have only tripled in that time. Over 90 per cent. of the cars brought from foreign markets during the past 3 years were supplied by American manufacturers. Canadian imports, last year, amounted to $9,397,616, while exports were $2,013,784

The value of all English imports between 1907 and 1912 have always been greater than the exports, even when deducting the re-exports, which usually amount to 10 or 12 per cent. However, only about 50 per cent. of the import values represent finished automobiles. Curious to note, while in 1907 the value of imported finished cars exceeded the exports by $4,780,000, in 1912 the exports were in excess by $3,119,500.

In the accompanying table are given the prices of automobiles imported and exported in the years 1907 to 1912 inclusive. During this interval it will be noticed that the prices of cars sold to foreign nations decreased only 7 per cent., while those bought

THE UNITED STATES FOREIGN TRADE DURING THE YEARS 1910, 1911 AND 1912

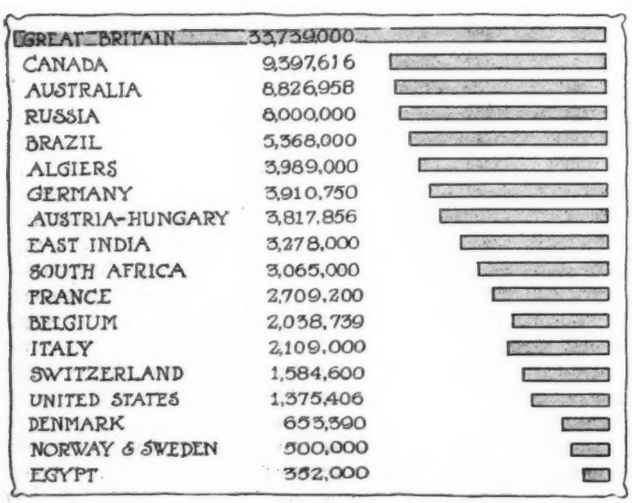
IMPORTS	1910		1911		1912	
	Number	Value	Number	Value	Number	Value
Automobiles	1,024	$2,080,555	972	$2,098,481	868	$1,999,587
Parts of, except tires	..	656,653	..	347,767	..	275,819
Total Automobiles and Parts	..	$2,737,208	..	$2,446,248	..	$2,275,406

EXPORTS	TOTAL AUTOMOBILES AND PARTS, EXCEPT TIRES					
Country	Number	Value	Number	Value	Number	Value
France	235	$704,684	420	$449,757	698	$531,163
Germany	105	303,468	115	124,615	450	366,914
Italy	119	360,785	176	199,986	288	257,050
United Kingdom	1,500	2,495,268	4,031	3,380,266	4,640	3,518,671
Other Europe	460	721,077	795	718,360	1,549	1,295,379
Canada	3,514	3,721,250	4,988	5,552,931	7,421	6,859,694
Mexico	351	645,237	297	490,041	274	459,203
West Indies and Bermuda	244	361,201	300	343,281	370	391,890
South America	422	474,980	1,116	1,356,445	2,201	2,539,166
British Oceania	874	698,736	2,476	2,217,762	3,385	3,091,966
Asia and other Oceania	349	430,460	813	795,576	1,650	1,640,369
Other countries	270	293,199	280	295,341	794	752,704
Total	8,443	$11,210,345	15,807	$15,930,461	23,720	$23,703,989
Bicycles, motor and other, and parts thereof:						
Imports	..	.....	..	62,457	..	173,349
Exports	..	.....	..	961,000	..	1,211,000

CANADA'S FOREIGN TRADE IN AUTOMOBILES

Country	VALUE		
	1910	1911	1912
Imports:			
Great Britain	.....	$328,984	$566,381
United States	.....	5,426,776	8,748,573
France	.....	90,965	67,086
Others	.....	6,852	15,576
Total	$3,659,054	$5,853,577	$9,397,616
Exports:			
To Great Britain	.....	55,986	83,224
United States	.....	142,072	232,585
Australia	.....	496,737	729,489
British South Africa	.....	128,096	293,875
New Zealand	.....	.....	224,367*
Others	.....	331,615	450,245
Total	$501,067	$1,154,506	$2,013,784
Parts of Automobiles and Motorcycles:			
Imports, 9 months ending December 31, from U. S. A.	$336,052	$649,874	$460,917
	312,020	626,127	.....

*9 months April-December, 1912.



Relative value of import trade of world

by England dropped 43 per cent. in that time, which was no doubt due to the increased sale of the cheap American automobile.

France

France, the parent of the industry, is still the leader in the export business, leading its nearest competitor, the United States, by nearly $20,000. In 1911 great anxiety for the future of the French foreign automobile trade was felt by home manufacturers due to the fact that no increase over the previous year was shown, but fresh impetus was given last year, when it took cars to the value of $42,396,760 to supply the foreign demand, 30 per cent. more than in 1911.

The consumers of last year's exports were:

Country	Per cent.	Country	Per cent.
England	27.0	Brazil	5.0
Belgium	22.0	Spain	2.4
Algiers	7.8	United States	2.4
Germany	7.0	Switzerland	2.2
Argentine	6.6	Italy	1.3
		Russia	1.2

Imports to France have been increasing steadily for the past few years, although this trade is small compared with the export. Figures for the past 3 years follow:

Year	1910	1911	1912
Automobiles	965	1281	1151
Value	$1,738,400	$2,307,400	$2,709,200

Good Americans will read with a great deal of satisfaction that the United States heads the list of importers to France, the percentage being 37, while her trade with us amounts to only 2.4 per cent. of the total. This is especially gratifying when it is remembered that it is not so very long ago that we were France's star customer.

It is interesting to note the development of the automobile in France for the past decade or more; the registration for the years 1900, 1907, 1910, 1911, 1912 being, respectively, 2,354, 31,295, 53,669, 64,209, 76,771.

Germany

The expansion of Germany's automobile business is well reflected in the value of her foreign trade in passenger cars:

Year	Imports	Exports
1907	$4,350,000	$2,425,000
1908	2,625,000	2,525,000
1909	2,275,000	4,275,000
1910	2,375,000	7,277,500
1911	2,450,000	10,575,000
1912	3,910,750	16,225,000

In 1907 the value of the exports to imports had the ratio of 2:1, while now it is 1:4.

German imports and exports for the past 3 years are as follows:

IMPORTS

	1910		1911		1912	
	Number	Value	Number	Value	Number	Value
Passenger cars	1,229	$2,375,000	1,244	$2,450,000	1,689	$3,910,750
Trucks	667	202,750	134	402,250	301	637,250
Total	1,269	$2,577,750	1,378	$2,853,250	1,990	$4,548,000

EXPORTS

	1910		1911		1912	
	Number	Value	Number	Value	Number	Value
Passenger cars	3,399	$7,277,000	5,136	$10,575,000	7,948	$16,255,000
Trucks	225	659,000	345	1,022,450	694	1,735,000
Total	3,624	$7,936,000	5,481	$11,597,450	8,642	$17,960,000

Italy

The character and rapid development of Italy's important motor trade are reflected in the following figures on imports and exports of automobiles:

	IMPORTS		EXPORTS	
	Number	Value	Number	Value
1905	.....	$1,261,000	.....	$510,000
1910	398	916,000	2,120	4,163,000
1911	686	1,345,000	2,918	5,825,000
1912	1,007	2,109,000	3,587	7,158,000

	1909	1910	1911
Automobiles registered	6,353	7,737	11,119

Belgium

Belgium's imports in 1912 amounted to $2,038,739, while the value of the exports was $6,349,534. The volume of the

Belgium motor industry, with England for its best customer, is reflected in the subjoined detailed statement:

AUTOMOBILES

	Imports	Exports
Germany	99	132
France	211	55
Great Britain	78	398
Argentine	...	...
Total	388	1,575
Value	$542,300	$3,770,544

CHASSIS

	Imports	Exports
Germany	217	345
France	505	145
Italy	253	...
Great Britain	50	...
Total	1,025	490
Value	$1,417,633	$2,204,977

AUTOMOBILE PARTS

	Imports	Exports
Value	$78,806	$374,013

PORTUGUESE IMPORTS

	1909	1910	1911
Automobiles	194	255	283
Chassis	34	43	82
Value	$460,000	$620,000	$820,000

Switzerland

The Swiss car trade is in a flourishing state. Exports have risen to $3,000,000, a considerable part of which is in trucks. Of the 301 motor trucks imported into Germany last year 834 came from Switzerland.

GROWTH OF THE SWISS TRADE

	Imports	Exports
1906	$589,200	$880,200
1907	642,800	1,071,000
1908	467,600	789,000
1909	708,600	1,259,200
1910	986,200	1,741,400
1911	1,378,400	2,260,200
1912	1,584,600	2,903,000

Switzerland had 4,937 registered cars in 1912, but more than double that number when tourist cars are included.

The following specializing list on the 1912 trade list will be of interest:

	IMPORTS		EXPORTS	
	Number	Value	Number	Value
Open cars	397	$750,119	665	$2,183,972
Closed cars	426	779,192	196	525,451
Motorcycles	371	55,384	995	153,700

Spain

The automobile registration of the country in January, 1912, totalled 5,816 cars, of which 1,461 were in Madrid and 1,040 in Barcelona.

Passenger service by automobiles is well developed, especially in the province Coronna with seven lines, Barcelona with six, Huesco, six, and Lugo with six lines, also in the Canary Islands with more than 100 automobile omnibuses. Prominently active is the Madrid automobile transportation company. The automobile salon is now being held, April 28 to July 2, at Barcelona, under patronage of King Alfonso.

Austria Hungary

Austria Hungary still largely depends on imports for a greater part of its considerable demand in motor vehicles.

	IMPORTS		EXPORTS	
Automobiles:	Number	Amount	Number	Amount
1911	1,452	$2,919,324	242	$824,982
1912	1,537	3,243,800	322	1,063,510
Trucks:				
1911	197	491,662	81	222,804
1912	159	574,056	59	190,586

Foremost among the importing countries in 1912 were Germany, with 911 automobiles and 125 trucks, and France, with 294 automobiles and 34 trucks.

Russia

Of the $8,000,000 paid by Russia for imported motor vehicles Germany gets the lion's share with nearly 70 per cent.

BRITISH IMPORTS AND EXPORTS WITHOUT DEDUCTING THE RE-EXPORTS

	1911	1912
Automobiles	8,418,016	8,950,722
Chassis	8,447,006	9,318,962
Parts of automobiles	12,491,996	16,745,358
Motorcycles	206,221	216,834
Parts of motorcycles	322,008	942,872
Total	29,880,498	36,174,749
Deduct re-exports	3,376,398	2,435,149
Net imports	26,504,100	33,739,600
British exports	17,365,600	21,535,500
Excess of Imports	9,138,500	10,824,100
British Exports:		
Complete automobiles	4,536	5,282
Chassis	735	1,179
Motorcycles	7,350	13,024
Total	12,621	19,485

IMPORTS (LESS RE-EXPORTS) AND EXPORTS FOR THE LAST 6 YEARS

	1907 Dollars	1908 Dollars	1909 Dollars	1910 Dollars	1911 Dollars	1912 Dollars
Imports.	20,780,900	18,649,400	19,459,900	23,044,700	26,504,100	33,739,600
Exports.	6,752,200	6,448,400	8,178,100	13,553,400	21,535,500	21,535,000

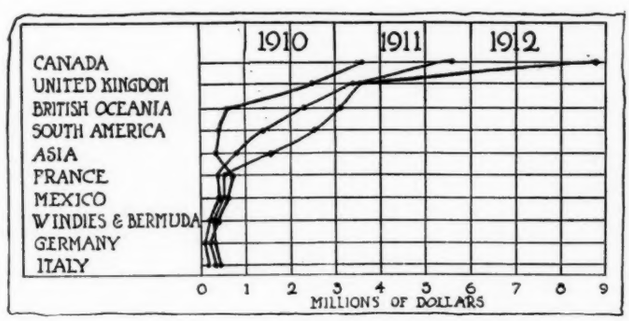
NUMBER AND VALUE OF COMPLETE MOTOR CARS

	1907	1908	1909	1910	1911	1912
Imports.	4,285	3,398	3,116	3,694	5,731	6,276
	$8,984,600	$6,022,100	$5,125,400	$5,899,600	$6,909,000	$7,198,100
Exports.	2,318	2,216	2,580	3,555	4,536	5,882
	$4,204,420	$3,969,000	$4,669,700	$6,747,300	$8,839,600	$9,917,600

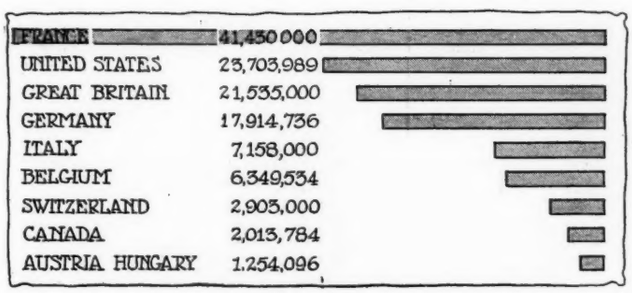
The Average Prices of Complete Automobiles Strongly Indicate the Advent of the American Car

PRICES OF IMPORTED AND EXPORTED CARS

1907	1908	1909	1910	1911	1912
2,115	1,777	1,634	1,562	1,241	1,210
1,813	1,769	1,808	1,896	1,950	1,687



United States export trade



Export trade of principal countries for 1912

The automobiles and trucks imported numbered in the years:

1907	1908	1909	1910	1911
563	879	1039	1944	2717

Denmark

Denmark has a small automobile industry of its own. The imports in finished cars had risen from 289 in 1910 to 441 in 1911.

Value of Danish imports were:

	1910	1911
Automobiles	$409,800	$610,740
Chassis	19,770	49,680
Parts	270	2,970
Total	$429,840	$653,390

Norway

Value of automobiles imported:

	1910	1911
Automobiles and parts	$182,300	$173,600

Sweden

Sweden imported in 1911 320 cars worth $457,576. Statistics for 1912 are not completed, but during the first quarter of 1913 the imports amounted to $170,000.

Australia

Australia imported last year $8,826,958 worth of automobiles, or far more than $2.00 per head of its population, an increase of 45 per cent. on the imports of 1911.

Imports by the several states of the Union:

	1911	1912	Increase, Per cent.
South Australia	$558,658	$1,000,271	79
Western Australia	195,738	335,047	71
Queensland	439,696	729,271	65.5
Victoria	1,563,903	2,588,836	65.5
New South Wales	2,131,911	2,331,856	9
Tasmania	147,289	127,032	Loss
Total	$5,037,195	$7,112,313	

Registration had risen in New South Wales from 3,992 cars in 1911 to 5,985 in 1912, an average of forty cars per week, which, when worked out on the population basis, gives one car to every 283 persons. Motorcycles increased from 2,793 in 1911 to 3,819 in 1912.

Victoria in 1912 had 4,683 cars and 3,217 motorcycles; South Australia had, January, 1913, 6,445 registered cars, 1,360 since June.

The total Australian imports, excepting New Zealand, were made up:

	1911	1912
Motorcycles	$286,434	$608,804
Bodies of cars	786,655	1,103,827
Chassis, etc.	4,988,298	7,112,325
Total	$6,061,388	$8,826,958
Canada's share was	496,737	729,489

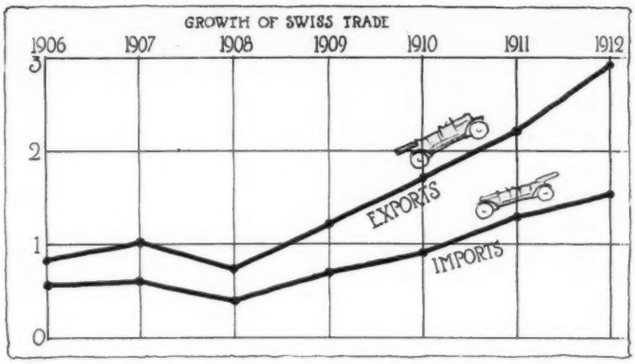
According to the 1910 census, Australia had 194 automobile and cycle manufacturers with 2,074 hands employed, 759 carriage builders with 7,649 hands employed.

RUSSIAN AUTOMOBILE AND MOTOR TRUCK TRADE

Year	Number	Amount
1902	37	$41,160
1903	71	56,203
1904	115	121,275
1905	103	119,315
1906	59	541,156
1907	1,049	1,047,620
1908	1,365	1,748,859
1909	1,565	1,981,952
1910	2,636	3,631,439
1911	3,851	5,304,446

DISTRIBUTION OF GERMANY'S FOREIGN TRADE

Country	Per Cent. Passenger Cars
Russia	19.0
Austria	10.6
Brazil	10.4
Great Britain	10.2
Argentine	8.8
Roumania	4.
Holland	5.6
Belgium	5
France	4
Denmark	3
Italy	3
Sweden	2.5
Java	2



The growth of the Swiss automobile trade has been phenomenal

New Zealand

The number of cars owned in the island of New Zealand probably exceeded 5,000. A count taken in 1912 revealed in:

	Cars	Motorcycles
Canterbury	1,482	2,078
Otago and Southland	535	791
Hawkes' Bay	500	322
Auckland	415	180
Wellington	88	83
Total	1,938	1,376

During 1911 1,500 cars and 1,300 motorcycles were imported. Canada's share in this trade has, like in Australia proper, become quite large. Canadian automobiles imported into New Zealand:

	1909	1910	1911
Numbered	19	93	336

Much interest is shown in developing passenger and freight lines by motor cars. At Christchurch four companies have recently been formed for regular service. The postal department of New Zealand owns the largst part of automobile trucks among the Australian states, the post office at Wellington alone having eight trucks.

Prices paid for American automobiles, which predominate:

Five-seated, 30 H.P.	$1,830
Four-seated, 20 H.P.	1,375

East India

The East Indian market for automobiles is rapidly expanding. In 1906 and 1907 imports in all were $1,413,941; in 1911 and 1912, $3,278,100.

The imports were divided as follows:

	1909-10	1910-11	1911-12
Cars	365	532	900
Trucks	5	1	5
Motorcycles	184	288	476

Car registration in Bombay exceeded 2,000 in 1912. An export item by the Bombay Motor Car Co., Ltd., of fifteen delivery wagons to Afghanistan is worthy of notice.

British South Africa

	IMPORTS 1911	1912
Motor cars and parts	$1,812,987	$2,831,825
From England	818,085	1,010,950
From Canada	128,096	293,875
Motorcycles and parts	357,396	755,756
Total	$3,116,564	$5,891,506

In Johannesburg, registration 820 cars, trucks are extensively used for delivery purposes; the municipal markets having been relegated to the suburbs, public motor trucks deliver the goods to the homes at nominal cost. The South African State Lines likewise have adopted automobile delivery.

Southern Rhodesia

	1911	1912
Vehicles, including bicycles, worth	$242,501	$234,244

Uganda

In Uganda an automobile line connecting the new Busoga railway with Lake Albert has been started and makes it now possible to get quickly from Mombala to Nimula on the eastern frontier of Belgian Congo.

China

Imports were 181,304 H. K. taels in 1911. (1. H. K. tael represents 1½ oz. silver, or about 85 cents in value.)

A recent German Consular report says that the wealthy Chinamen almost exclusively take American machines, which are cheaper.

Shanghai had in the year 1912, some 500 automobiles.

Japan

Japan probably has now over 700 automobiles. In 1911 the licenses taken out in Tokio and Yokohama totalled 194; in 1912, 413; Tokio, 305; Yokohama, 108.

Ceylon

Ceylon's imports in motor vehicles during 1911 amounted to $660,000.

Siam

Siam imported during the financial years 1911, 1912, 105 automobiles, principally open carriages with moveable covers, closed ones not being in favor. From England came forty-four; from Germany, thirty-one; France, fourteen; United States, eight, and Belgium, four.

Philippine Islands

PHILIPPINE ISLANDS IMPORTS

	1909	1910	1911
Value	$74,249	$752,640	$1,257,810

Manila had in January, 1912, 800 cars registered, of which 20 per cent. were French.

Argentina

Argentina imported in the 4 years 1905-1909, 3,040 automobiles, of which 35 per cent. came from France, 15 per cent. from Germany, 12 per cent. from the United States, 10 per cent. from Italy and 10 per cent. from England.

Since then America has gained, though the German export lists, which give records by weight, also show large increase, from 141 tons in 1910 and 336 tons in 1911 to 864 tons in 1912.

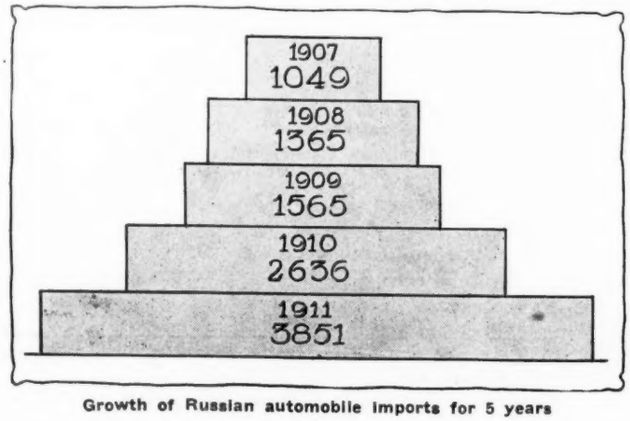
IMPORTS

	1910	1911	1912
Automobiles	1,610	2,472	4,015
From France	45 per cent.	36 per cent.	35 per cent.
From Italy	15 per cent.	15 per cent.	10 per cent.
From United States	12 per cent.	20 per cent.	15 per cent.

In October, 1912, Buenos Ayres had 4,900 registered cars, of which 1,100 were taxicabs.

Brazil

America's very successful automobile invasion of the Argentine Republic and Brazil has been gratifying. Our imports to Brazil have risen from 95 automobiles in 1910 and 301 in 1911 to 783 during 1912. There are now represented in Rio de Janeiro forty-seven United States makers, besides fifty-one French houses, twenty-five German, thirteen Italian, nine Belgian, four Swiss and one Austrian firm. Germany, however, heads the imports, which are shown in the table.



Growth of Russian automobile imports for 5 years

BRAZILIAN IMPORTS OF AUTOMOBILES AND PARTS

Country	1910		1911		1912	
	Number	Value	Number	Value	Number	Value
Germany	172	$281,000	315	$506,000	1,060	$1,526,000
France	280	409,000	511	716,000	1,011	1,471,000
U. S. A.	95	110,000	301	361,000	783	924,000
Italy	67	106,000	189	293,000	432	638,000
United Kingdom	37	68,000	133	219,000	205	318,000
Switzerland	43	72,000	93	143,000	136	247,000
Belgium	9	16,000	23	36,000	120	186,000
Sweden	27	52,000	...	.....	...	.....
Other countries	5	9,400	9	19,700	38	58,000
Total	735	$1,123,400	1,574	$2,293,700	3,785	$5,368,000

Trinidad

Trinidad in 1912 imported forty-four cars, valued at $66,438, of which twenty-nine, worth $41,505, were from the United States.

Guatemala

Guatemala has 100 motor cars, mostly of American make. The demand for cars exists mainly in the town of Guatemala itself, as most of the planters have their offices and dwelling houses in the capital.

Peru

Peru's imports of motor vehicles amounted to $42,811 in 1911, against $14,450 in 1910.

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San Antonio Wants To Run Vanderbilt Race

NEW YORK CITY, Oct. 13—With the abandonment of road racing in Savannah, Ga., the San Antonio Automobile Club, according to J. L. Carrington, secretary of that organization, is prepared to run the Vanderbilt Cup race this year. Already $7,500 has been subscribed, and several courses are available. Dr. W. A. Henning is now in New York in the interest of the project.

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Seattle Race Meet Draws 2,500

SEATTLE, WASH., Oct. 14—A crowd of 2,500 witnessed the automobile racing at Madison Park, Seattle, on October 5. One thing the races accomplished was to prove that it is dangerous to race on the half-mile track such as is built at this park.

While practicing before the races, Joe Thomas, driving a Ford, crashed through the rail, miracuously escaping death. The Australian pursuit race, for the W. A. Avery trophy, was won by Earl Staley in the Studebaker. There were three entries, the Romano, driven by Percy Barnes; the Locomobile, driven by Henry North, and the Simplex driven by Joe Wagner.

The big event of the day was the 20-mile race for the Hotel Washington trophy. It proved very exciting and was won by Henry North in a Locomobile. Time, 25 minutes and 3-5 seconds. In the 10-mile event for the Albert Hansen trophy Staley again won in the Studebaker, his time being 13 minutes and 49 seconds.

The distance, mile against time race, from a flying start was won by the Romano, Percy Barnes driving, in 1.11. He won the Bennett-Hammersbery trophy, which was the award for this race.

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TORONTO, ONT., Oct. 13—Regretting the large number of automobile accidents in this city during the past fortnight due to the carelessness of drivers, the Criminal Assizes' jury presentment made Saturday to Justice Middleton, recommends that the driver of every automobile be required to pass a qualifying examination and pay a moderate license fee and let the car go free as in itself the automobile is harmless. The jury believed that in Canada the mistake was in licensing the motor itself instead of the driver.

Dunlop for Low Inflation on Bad Roads

Inventor of the Pneumatic Tire States That the Smoother the Road, the Harder the Tire Should Be Inflated, But Considers It Injurious To Use High Tire Pressures on Rough Surfaces

By J. B. Dunlop

BELFAST, IRELAND—Editor THE AUTOMOBILE:—I was very much interested in the recent brief digest of a German booklet by Herr Bobeth, entitled "Comprehensive Tests to Develop Data for Improvements of Springs and Tires," which you published. With regard to tires, I quite agree with the author of the booklet that the side walls of tires should be made as thin and flexible as possible, consistent with durability and strength, sufficient to resist internal air pressure, but he does not appear to say in what manner increased flexibility is to be obtained. I presume the aim of every good maker of tires is to obtain increased flexibility of the whole tire outside the rim. Flexibility and strength depend on the good quality of the cotton fiber composing the fabric; also the correct amount of twist given to the threads, and most of all the employment of pure Para rubber mixed with sulphur only, and well frictioned into the fabric, or cords, forming the cover or inexpansible jacket.

Special Fabric Manufactured

Perhaps I should mention that when the tire industry was founded in Belfast under my supervision early in the spring of 1899 the fabric used was especially manufactured to my order by the Island Spinning Co., Lisburn. It was cut on the straight. The circumferential threads at the tread were strong and close together. The circumferential threads at the side walls were just sufficiently close together to hold the cross tread in position and prevent the air tube from being blown between the treads.

The rubber solution, pure Para, was applied to the fabric by hand, the fabric being placed on a side bench covered with zinc sheets and three coats given. The first coat of solution was thin and passed right through the fabric to the zinc. These tires gave no end of wear and the wearing qualities as well as speed were in a large measure due to the thinness and flexibility of the side walls.

Cut Determines Manner of Weaving Fabric

Perhaps I should mention that the straight-cut and the diagonally cut fabrics require to be woven quite differently from each other. A serious mistake was made at one time by a large firm that cut fabric diagonally which had been woven in a way suitable for being cut and built up on the straight, and the results were very serious in England, America and on the Continent. I was asked to pay a special visit to France and Germany on account of this mistake, which was entirely due to want of caution. In France I saw piles of fabric cut up which had to be scrapped.

Some people in America imagined that the quality of the cloth was bad because the tires were only on the road a very short time when they burst. The fabric was made of flax of the finest quality, but it was woven too open for being cut and built up diagonally, and in consequence of the bearing area, at the points where the threads crossed each other, being very small, the threads crossing each other were free to move in rotation to one another. Friction was set up and the threads were sawcut right through after the tire had been a very short time in use. This condition, of course, had to be changed.

Cotton Better for Most Tires

A fairly open woven fabric, cut on the bias, would, no doubt, be practical and speedy as the cord or unwoven fabric but for the fact that there is little or no rubber between the threads where they cross. At these points the threads are non-adherent to one another and therefore friction is set up, the result of the varying strains or tensions of the threads when the tire is in use. In any case linen is not nearly so good as cotton for a tire composed of bias cut woven fabric. In a cord tire, linen would probably be as speedy as cotton or speedier. Cotton is much more elastic than linen and would probably wear better in a cord tire, but for speed the less elastic the threads are the better. Theoretically the air should be the elastic medium, not the cloth. Rigidity is required in two directions and elasticity in a radial direction. The cord fabric or bias cut woven fabric is incomparably superior to straight cut for preventing side roll. Any one who has studied the lattice girder will understand this. At an early date in the tire history I placed a special home-made band around a bicycle tire. This tire was probably then the fastest tire in use. It was ridden at Balls Bridge by Magennis, on the track in England by Arthur du Cross, and on the road over 3,000 miles. This was the first tire made with open sides and rubber between the fabric and the edge of the rim. This tire is still in my possession.

In the motor tire the effects of the undesirable elasticity, due to the closely woven fabric and to the necessary thick rubber at the tread, is in some measure counteracted by the usual strips of fabric at the tread near the surface of the rubber.

Internal Friction Not Duly Considered

The matter of friction between the threads composing the fabric and the advantages and disadvantages of more or less rubber between the folds of the fabric or between the layers of cord in cord tires are, no doubt, well understood by manufacturers. The relative amount of heat generated owing to friction between the tire and the road and the heat generated in the body of the cover—between the threads and in the rubber itself—has not, I believe, been duly considered. I need hardly say that the amount of heat generated between these several parts varies according to the make and structure of the tire.

Most people will agree with Erich Bobeth when he says that the smoother the road the harder the tire should be inflated. Obviously if a tire were pumped very hard it would cease to act as a spring and would be of no service on bad roads; on the other hand, steel wheels or steel rims on steel rails are much faster than any pneumatic could possibly be on any road however hard and smooth, because little or no spring is necessary.

I cannot share Erich Bobeth's opinion when he says that developing the tires so that they "will endure flexion of the side walls better" will enable us to reduce the inflation. It is undoubtedly an advantage to increase the flexibility of the side

walls, as that must reduce friction in the side walls and therefore increase speed at any given air pressure, but we must bear in mind that distortion or displacement of the tire takes place as each succeeding portion comes into contact with the road, and that that distortion increases as the air pressure is reduced. Momentum or energy has to be put into the tire to produce distortion, and at high speeds there is no time for the return of the momentum or effective response where the tire leaves the road. When we consider the flattening of a soft tire on the road, especially at high speeds, it is not momentum we have to consider, but rather the loss of energy—energy put into the tire and not given out again. The former is mass multiplied by velocity, the latter mass multiplied by velocity squared.

When the first pneumatic-tired bicycle was sent by the Pneumatic Tyre Co. to London to Laurie to try, early in 1890, he reported that the pneumatic tire was slower than a solid. He must have ridden the tire too soft, hence there was great loss of power. I presume Laurie had not received instructions to pump the tires hard for racing. When I lent my racing bicycle in August, 1889, to James McCormick to race at Portadown on a level cinder track, and also to race at Liverpool and Bury, he won all the races at Portadown and the open races at Liverpool and Bury, although he was severely handicapped. I instructed him to pump the tires hard, especially on the Liverpool track, which was rather smooth.

Not wishing to take up too much of your valuable space in one issue, I shall endeavor in the course of a week or so to send you a few more notes on tires, some of which may be historical. It might be of some interest to those readers of THE AUTOMOBILE who are not experts at tire making and who may not have had leisure to consider the question to know how a vehicle is supported on a pneumatic tire. After that again I may refer to Erich Bobeth's theories relating to springs and shock absorbers.

In the meantime I should say that I endorse Herr Bobeth's opinion that tires a few years ago, as a rule, were pumped too hard, and as a result the life of the tire was shorter, the rubber was more readily cut, and the chassis as well as the body was sooner worn out, due to increased vibration, not to mention the discomfort of the passengers.

Claims That Advertising Created Demand for Electric Starter

EDITOR THE AUTOMOBILE:—I have read with much interest an editorial under the title of The Eventual Gearshifter in THE AUTOMOBILE for September 18. The statement is made therein that "the electric gearshift has received the call because people are thinking electrically in the automobile world today." This statement is undoubtedly true and is furthermore a remarkable example of the efficiency of the advertising columns of your paper and other mediums which carry pages upon pages of electrical advertising.

As a matter of fact, this advertising is the reason "that people are thinking electrically" and it is this "created" public demand which has forced the automobile manufacturer to equip with electric devices, in many instances even against his own judgment.

Many Engineers Favored Air Starters

Many of the more prominent engineers connected with the industry favored air starters from the beginning and do today, but this "created public demand" has actually forced them to recede from their original positions.

While I do not believe that the editorial in question is inspired, it does seem to have a decided bias in favor of the electric against all forms of gearshift and, while the arguments brought forward in favor of electricity are fairly sound, they are somewhat misleading.

For example, electric switching in railroad yards is mentioned as a shining example of the positive nature of electricity and the inference allowed to remain that the electric gearshift operates in a somewhat similar manner to the railroad switch.

No one can criticize the effectiveness of the high-powered electric motor used in railroad switching when furnished with a sufficient supply of current from a central station, just as we all admit the many advantages possessed by electric light for illuminating purposes where a proper installation can be made. But would you care to travel on a railroad that depended on solenoids for switching the train you were on?

As a matter of fact, the use of the electric motor for railroad switching proves absolutely nothing in favor of the present type of electric gearshift because there is no similarity in the two methods of using electric power.

If the railroads are so impressed with the positive action of electricity, why do they use air brakes? Why not electric? There is enough electric equipment on railroad cars to enable them to use electricity for brakes, if they wished to, but it seems they would rather trust to air.

It is annoying to find upon getting into your berth with the intention of reading THE AUTOMOBILE before going to sleep that the incandescent emits a light something like a sick glowworm with a veil on, and while the porter assures you "lights will be bettah boss aftah we gits agoin' " you wouldn't feel very comfortable while thinking of what might happen if the same kind of electricity had to be depended upon to set the brakes in an emergency. No, the power used by the railroads to do *important* work on trains that have to be moved by their own power is air, not electricity. I am as enthusiastic as anyone about the use of electric light in coaches and generally it works to perfection and I like the little electric bell in the buffet car that brings the Senegambian with the very small bottles and the very big check and I like the electric fan, even if it does sometimes stir up a lot of dust as well as air. And the ladies like the electric curling iron heaters, that some thoughtful magnates provide, but when it comes to brakes I'll take air. When power in some form has to be generated en route it would seem that for dependability the experienced transportation people have given air preference over electricity, especially for important operations. Where electric installations are stationary they are generally satisfactory, though perhaps expensive.

Another factor which will largely determine whether air or electricity will have the call in gearshifting is ignored entirely in your editorial and that factor is economy. It is only necessary to look at and to pay the monthly household bills for electric light and power to realize that electricity costs a great deal and it must always under present conditions be expensive, because it takes power, and power spelled with a capital P, to generate electrical current.

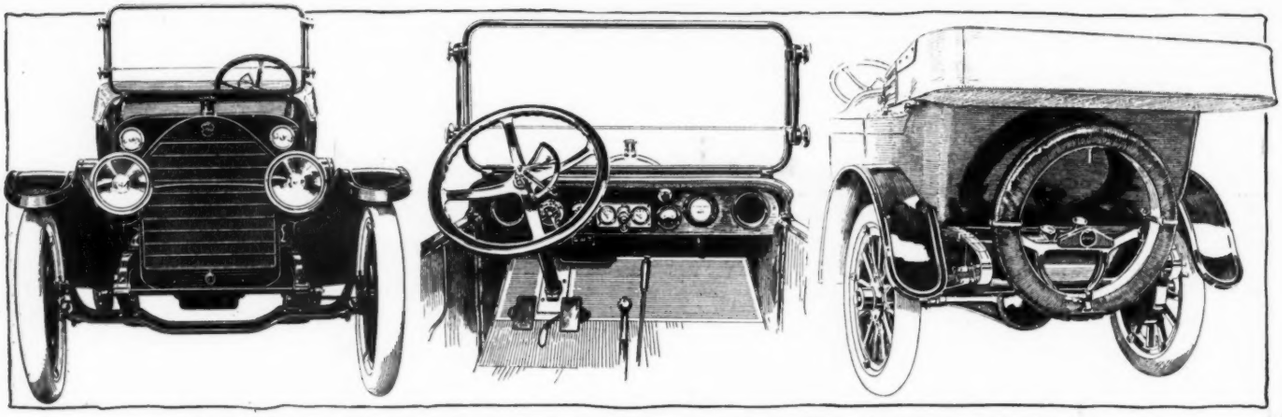
Air Is Positive and Economical

Consequently, when your only source of power is the power you should use to propel the car, electricity is expensive, not only in gasoline cost, but in power cost. Why even the street car companies, with an overhead trolley wire supplying constant power, prefer to use air for brakes. They know it is positive and economical and they need all the power they can get even with a constant supply to drive the car.

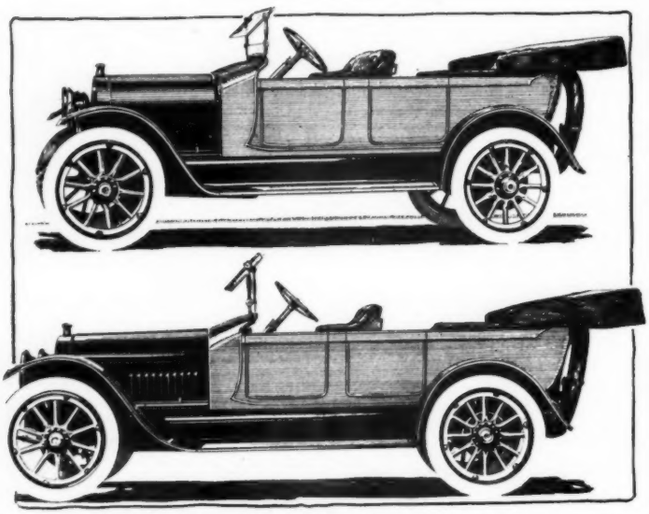
But perhaps the most startling paragraph in the whole editorial is the apology you make for the lack of efficiency in the present type of electric gearshift, following as it does the statement that "the gearshift must be positive, positive 100 times out of every hundred."

We have spent 2 years' hard work on the Gray pneumatic gearshift to accomplish this result and we should not dream of presenting it to the public and the car manufacturers if it were not just what you say a shifter must be — 100 per cent. efficient.—J. L. SUGDEN, Gray Pneumatic Gearshift Co., Chicago, Ill.

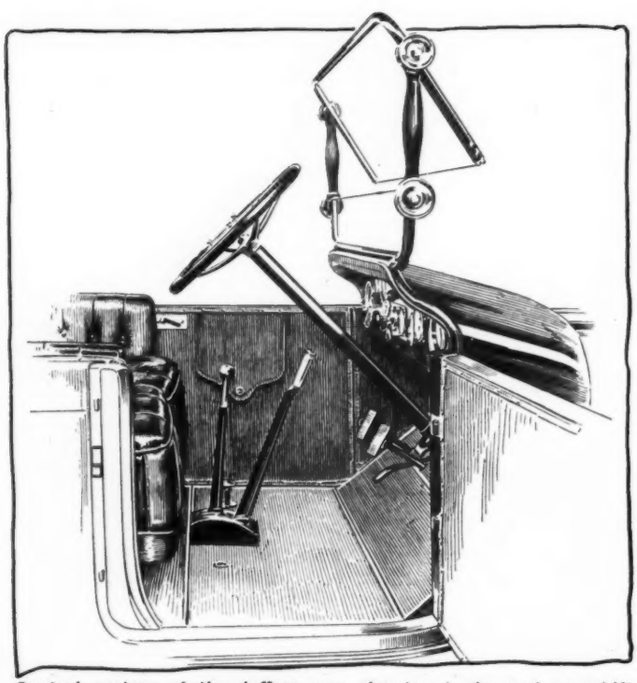
KOKOMO, IND.—The efficiency of the Vulcan electric gearshift was recently demonstrated on a 700-mile trip made by George H. Strout, sales manager of the Haynes Automobile Co., from this city to Sioux City, Ia. In a Haynes model 26, five-passenger touring car, he drove through over 60 miles of tough mud between Cedar Rapids and Waterloo without taking his hands from the steering wheel, the gearshifter working every time without a failure.



View of front of the car, instruments on cowl board and rear mounting of gas tank and extra rim



Four and six-cylinder Jeffery touring car bodies



Control system of the Jeffery car, showing brake and gearshift levers

Exit Rambler and Enter Jeffery

Two Chassis, a Four and a Six, Take Place of Rambler Cross-Country—Four-Cylinder a Block Motor

FOR 1914 it is the Jeffery car and not the Rambler, the now well-known names of Rambler and Cross-Country having been dropped and Jeffery adopted as the official name for the 1914 product of the Thomas B. Jeffery Co., Kenosha, Wis.

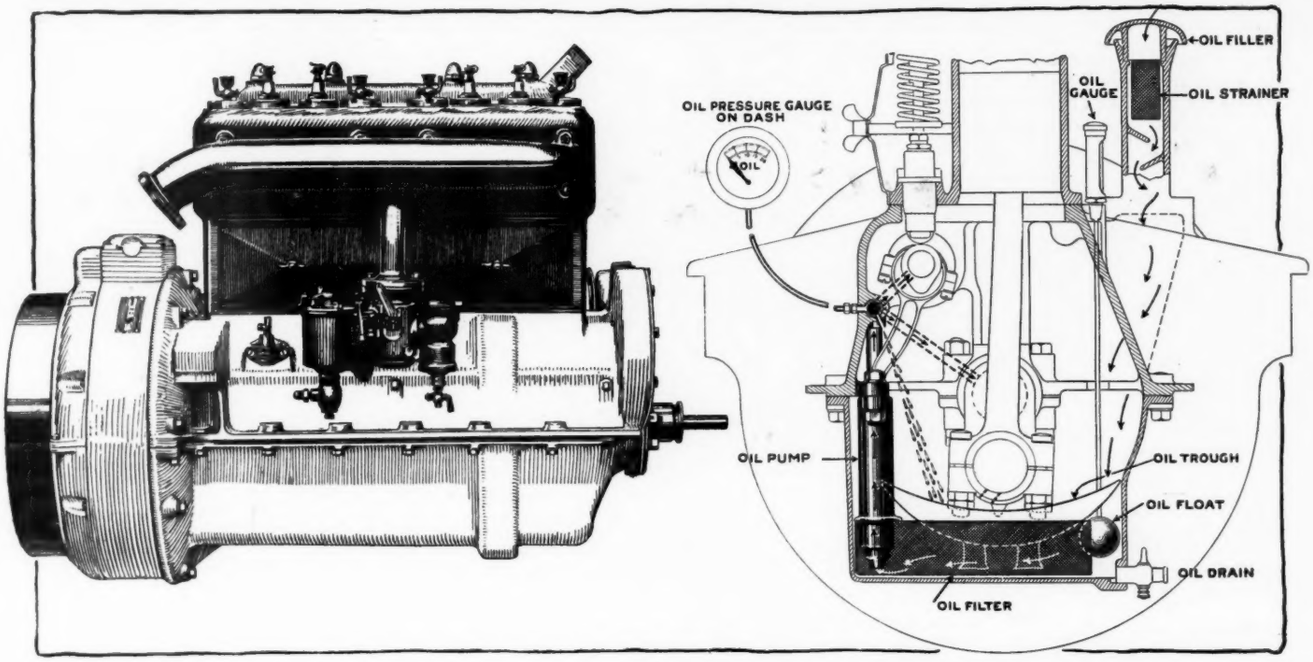
In addition to a new name there are new cars, a new four-cylinder block motor which will be the big seller, and a new six-cylinder type built along much the same lines as the four.

The four is a 22.5 horsepower vehicle, cylinders 3.75 by 5.25 of the L-head type in a block casting. As a five-passenger car it lists at $1,550, including the four-speed gearset, floating axle, 116-inch wheelbase and 34 by 4-inch tires. As roadster it is listed at $1,550, as a four-passenger sedan at $2,350 and as a limousine at $3,000. The new six, using the same cylinder sizes but with twin L-type castings, is built with 123-inch wheelbase, 36 by 4.5-inch tires, and as a five-passenger car lists at $2,250, as a six-passenger at $2,300, as a five-passenger sedan at $3,250, and as a limousine at $3,700.

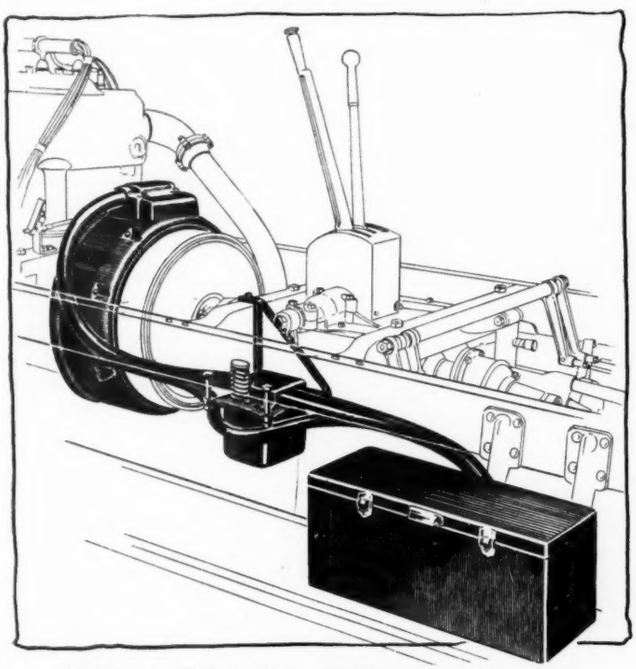
Many New Features

Both of these models are full of features of construction which are new to the Jeffery company. This is the first time that a block type motor has been used by them in a four-cylinder car; it marks the entry of the company into the six-cylinder ranks; both models are fitted with the steering column on the left and center control levers in contrast with right-hand control used up until the present; the U. S. L. starter and lighting system adopted for 1913 is continued as an integral part of both motors. For the first time a four-speed gearset is employed and it is characterized with direct drive on the third and a stepped-up gear on fourth. In the four-cylinder motor are spiral timing gears, and in the six this type of drive is also made use of; valve springs and parts are inclosed; gasoline is fed by pressure; there is a new design of leather universal joint between the clutch and gearset, and externally the appearance of the cars is entirely different.

The four-cylinder motor, while officially rated at 22.5 horsepower, shows 40 on block tests at 2,000 revolutions per minute,



Carbureter side of motor and sectional view, showing the oiling system and piping of oil pressure gauge



Installation of the U. S. L. starting and lighting system

a performance due to large valves, 1 7-8 inches in diameter, large intake and exhaust passages and light reciprocating parts. The pistons with rings and wristpins, weigh 3 pounds each. Piston displacement is 231.9 cubic inches.

Robustness in motor details has been kept in mind. All parts are large, an example being the three crankshaft bearings, the front and center ones, 3.25 inches each and the rear 4.5 inches in length. The size of the latter is partially explained by the fact that it also supports the combined motor-generator-flywheel of the U. S. L. electric system. With the view to increasing the power and flexibility of the engine the offset crankshaft is employed in this motor.

The intake manifold is, in reality, a part of the block casting, the Rayfield carbureter attaching by a short brass pipe. The exhaust manifold, above the intake connection, is high enough so the carbureter may be placed above the side frame member, making the carbureter accessible and yet not located where there is danger of burning the hands on the exhaust manifold when carbureter adjustments are made, or interfering with valve spring accessiblity.

The timing gears have spiral teeth to reduce noise which is further lessened by inclosure of the valve stems and springs.

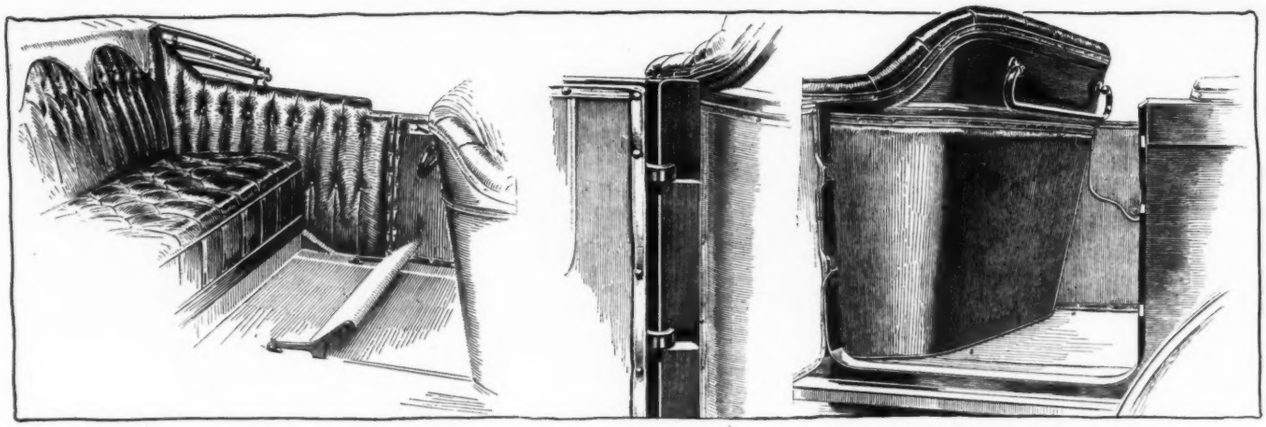
Lubrication of the motor is by combination of force feed and constant level splash systems. Oil from the sump or reservoir under the crankcase is pumped through a tube extending the entire length of the crankcase with lateral connections leading to each main bearing and to each camshaft bearing. Any surplus supplied to the bearings drips into small pans under the connecting-rods. An open-end tube projects from each connecting-rod and leads to the connecting-rod bearings. At each revolution of the crankshaft this tube dips into the pan and forces sufficient oil directly to the connecting-rod bearing for the purpose of supplying oil to that bearing.

Constant Lubrication Assured

There is constant circulation of oil by means of a cam-driven pump operated by the camshaft and the oil is circulated to and through every bearing in the motor and is strained before being used each time. The cylinder walls receive their oil from the splash. An indicator on the crankcase shows the quantity of oil in circulation and the dash pressure gauge indicates its rate of supply to the bearings. Factory tests on oil consumption are said to have shown about 800 miles per gallon.

Ignition is a Bosch duplex system, the magneto being mounted on the left in the rear of the water pump. Between the timing gears and water pump is a two-piece leather coupling, and between the pump and magneto is an adjustable coupling for timing the magneto.

One of the features of the general arrangement of fittings is the very clean way in which the ignition, lighting and cranking system wires are taken care of. These are carried in conduits and are installed in a permanent manner. The battery portion of the duplex system is a set of dry cells. These are hung in a bracket underneath the cowl where they are protected from rain or dust. The bracket can be slipped out by loosening two nuts when a new set is needed. The use of dry cells for



Body refinement features incorporated in the new Jeffery car, showing upholstery, foot and robe rails

the ignition separates the latter entirely from the lighting and cranking system, so that even with the storage battery out of order there would be no difficulty in starting with the hand crank because battery current still would be available.

The gasoline tank is hung at the rear, and air pressure is supplied by a small cam-driven pump. Intake air for the carbureter is heated by a drum around the exhaust manifold.

There is no mud pan, but plates from the frame members to the crankcase are substituted to prevent water or road dust getting into the motor.

Electric lighting and starting is an integral part of the motor, as the combined motor-generator forms the flywheel of the gasoline engine. It is a part of the U. S. L. system whose feature is the entire absence of gears in either the generating or cranking mechanism.

Backwards from the motor are as many improvements and constructions new in Jeffery products as there are in the power plant.

In combination with the flywheel is the cone clutch, the movable member of which is operated on a swinging cross-arm designed to retain the alignment between the two clutch members. The cross-arm is hung at either end in the side frame members and release and engagement of the clutch is through a toggle-joint combination. The clutch face is leather with spring inserts. On the clutch pedal shaft is mounted a pad on a short, adjustable swinging arm that presses against the edge of the clutch when the latter is released. This stops the rotation of the clutch and forms the clutch brake to provide silent gear shifting.

Clutch and motor have three points of support, two arms from the rear end of the motor attaching directly to the side frame members while at the front a trunnion block is mounted on the upper side of the front frame member the latter is dropped enough to bring the forward and rear supports on a level. This flexible three-point support prevents the alignment of the motor from becoming disarranged by twists in the frame when rough roads are encountered.

Leather Universal Used

Amidships of the frame is located the four-speed gearset and between it and the clutch is a *leather universal.* This consists of six leather rings, about 6 inches in diameter and 3-16 inch in thickness. Between these are three triangular steel pieces through which bolts pass to hold the leather rings in place. The flexibility of the leather is depended upon to take up any misalignment between the clutch and the gearset and at the same time the leather makes the transmission of power from clutch to gearset softer, so that the effect is the same as if a smoother clutch action were obtained.

To support the gearbox there are two cross members of the frame and upon these the gearbox is bolted. The gearshift lever, which has been arranged for central control, is a part of the gearbox, that is, it extends directly from the latter without cross rods.

The entire gearbox is operated by shifting rods and so on and weighs less than 100 pounds according to factory tests. The direct is on third speed and fourth speed is geared up somewhat. Nickel-steel gears are used. From gearset to rear axle is a propeller shaft with a Spicer universal joint at each end.

Floating Rear Axle

The rear axle is a late development of the floating type fitted with imported ball bearings throughout. There is a neat adjustment for the bevel drive so that any looseness may be taken up between the bevel gears without tearing down the axle. On the forward side of the differential housing around the drive shaft there is a notched screw-in plate, which moves the bearing backward or forward and the amount can be gauged by a combined indicator and lock which engages in the notches.

The drive is taken through an A-shaped torque bar connecting the rear axle and central cross member.

There are two sets of brakes, concentric to each other in the rear wheel drums.

The three-quarter elliptic rear springs are connected directly at the forward end of the upper leaves to extensions of the riveted gussets which reinforce the rear corners of the frame. This direct connection is employed because it permitted the attaching bolts to be placed through the gussets outside of the springs themselves so there need be no bolt holes through the leaves. As mentioned before, vanadium steel has been chosen as the material for the springs with the view to minimizing chances of spring breakage without making them cumbersome enough to be heavy and sacrifice easy riding qualities. The double stirrup type of spring shackle is employed, and all are provided with grease cups.

The main frame extends 18 inches in the rear of the main rear member and at the ends of the side members there is a final rear cross piece connected to the side ends by Brown's castings which carry the tire irons. To the final cross member is hung the fuel tank so that the latter is supported directly from the frame.

A Gemmer steering gear is used. The corrugated steering wheel is 18 inches in diameter.

The selection of materials has been given careful consideration for a car of this price. The layshaft, propeller shaft, steering knuckles, steering knuckle arms and so on are made of chrome-nickel vanadium steel. Vanadium is added to the molten steel alloy to purify it of minute particles of slag and other impurities which prevent the steel from knitting closely together. The use of vanadium is believed to produce a tougher and closer grain steel than if it were not so treated and therefore will stand more strain, more shock and more vibration than ordinary good steel without vanadium. In the springs, as well, special chrome vanadium steel is employed on account of its ability to

withstand fatigue from the constant bending backward and forward, with little tendency to crystallization. Chrome-nickel steel is used in forging the front axle, the idea being to make the axle as tough as possible to resist crystallization and at the same time have it as light as may be. The result has been that the axle weighs approximately 13 pounds less than any other front axle the company has turned out.

Similar in almost every respect to the four-cylinder Jeffery is the six-cylinder. The motor has the same design of cylinders which are of the same dimensions although they are arranged in pairs. With the motor is incorporated the power tire pump for which only the base-plate appeared in the four, the pump being supplied at extra cost in the smaller model.

Pulley Integral with Fan

The six-cylinder motor agrees also in the fact that the timing gears are gear-driven and the fan is an aluminum casting of which the pulley is a part. The Rayfield carbureter is water-jacketed on the six and also the brass intake manifold is water-jacketed. In other respects the two cars are the same except in the matter of size. The six-cylinder car has a wheelbase of 128 inches and 36 by 4.5-inch tires.

The Jeffery bodies are new designs with exceptionally wide doors, deep cowls and straight-line hoods with rounded top. A general use is made of mouldings there being a 3-inch one along the top of the sides and a rolled steel one around the doors. Doors have concealed hinges and inside handles.

Cowl and dash are stamped from a single sheet of steel and the rounded back and sides are spot-welded so that the whole body becomes practically a single piece. The rather short motor space has permitted roomy front compartment and particularly ample tonneau, although the wheelbase is conservative.

The arrangement of instruments on the cowl board shows an attempt to combine a pleasing array with an accessible location for the driver. The instruments include ignition switch, ammeter, oil and air pressure pump and gauge, and speedometer. At either end are two drawers for goggles and other small articles.

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Electric and Pneumatic Shifts Work Well

CHICAGO, ILL., Oct. 11—Two different types of leverless gearshifting arrangements were tried out in the fall interclub reliability run of the Chicago Automobile Club and the Chicago Athletic Association yesterday and both proved themselves thoroughly dependable, exciting great interest among the 100 participants in the tour. The Haynes, which acted as an official car, was equipped with the Vulcan electric gearshift, which is stock on all Haynes models and one of the contesting cars, a Cole six driven and owned by N. H. Van Sicklen, Sr., was fitted with the Gray pneumatic gearshift. That the air system as fitted to this Cole worked satisfactorily is attested by the fact that Van Sicklen finished the run with a perfect score, the numerous gear changes occasioned by the heavy traffic in the city being negotiated without difficulty.

Electric gearshifting as exemplified in the Haynes had, if anything, a harder test as this car carried the starter and clerk of the course. The duties of these two officials required that they be the last to leave morning and noon controls, and yet be the first to arrive at noon and night controls. Consequently, fast driving and no lost time were necessities for this car. During the entire run of the Haynes the city traffic of Chicago and the rolling roads of northern Indiana were negotiated without difficulty. Particularly in towns were the possibilities of the electric gearshift shown in the way the driver could get away ahead of the crowd when held up at crossings by the traffic officers. This was due in part to the fact that the driver could set his second speed while the car was picking up on first and slip into second when the time came simply by releasing the clutch and letting it in again—this without taking either hand from the steering wheel.

In the few hills encountered, the electric gearshift proved valuable, for the driver set his intermediate long before it was necessary to shift and when the time came, let the clutch out and in again and the car was in second so easily and silently that the observer hardly could tell when the shift occurred unless he saw the slight movement of the driver's fingers that effected the change. One of the things that impress the observer upon his first ride in an electrically-shifted car, is the silence of the speed changes. The shifting mechanism does not get the full pull of the current until the teeth of the gears are started into mesh. This does away with the clashing of gears.

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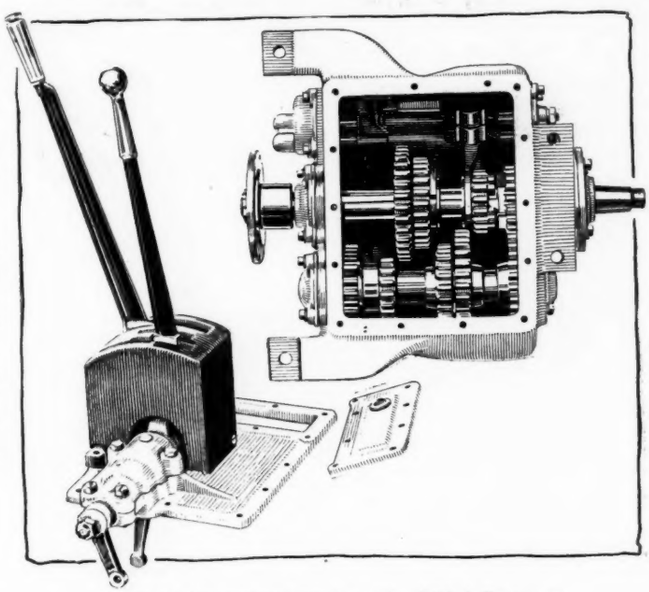
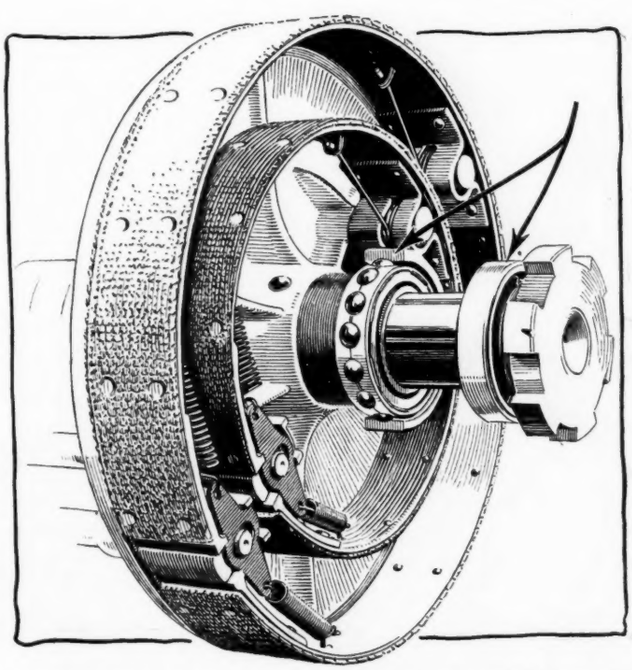
Dr. Diesel's Body Reported Found

LONDON, ENG., Oct. 13—The body of Dr. Rudolf Diesel has been found at the mouth of the Scheldt, according to despatches from Amsterdam, but, owing to the rough weather prevailing, was abandoned by the boatman who found it. Certain valuables found on the body have been identified by the inventor's son.



View of the gearset used on the 1914 Jeffery car



Double brakes mounted on rear wheels, showing wheel bearing

Fig. 1—New plant of the Electric Auto-Lite Co. at Toledo for manufacture of starting, ignition and lighting systems

Efficiency Methods Used by Auto-Lite

New Factory Has Capacity of 100 Starting and Lighting Systems Per Day

IT is not more than 3 years ago that the idea of installing complete electric plants on automobiles for lighting and starting purposes was regarded by many engineers as an impracticable proposition. By next year the omission of such an important accessory to the car's equipment will probably render any otherwise first-class machine almost unsalable.

This eager appreciation and consequent demand on the part of the up-to-date automobilist for the facilities and cleanliness of electrical apparatus is reflected in the surprising activity displayed in the plants of practically all manufacturers of generators and starting motors that can claim a reasonable degree of reliability and efficiency.

This is not to say that all are meeting with equal success. The increasing size of the market for these electrical equipments can only be taken full advantage of if the manufacturer is able, first, to offer a sound and efficient product; second, that he can by attention to methods of manufacture produce it at a reasonable price, and third, that his factory size and facilities enable him to turn it out in sufficiently large quantities to cope with the demands of the large automobile makers who adopt it as a standard equipment on their cars.

In these days it is quite impossible for the maker of even a passably good article to continue in production unless his factory is run on lines which take into account the efficiency of all the operations through which the parts making up the finished products pass in the manufacturing and assembling processes. It is absolutely necessary to seek any possible sources of loss in the factory operations and apply the remedy. While much depends on the actual machines used in quick production factories, a point aside from this that is not easy to exaggerate in importance is summed up in the word location. A set of first-class machines arranged without careful consideration to location, so that much time is lost in the transport of the parts from machine to machine, does not produce the best possible results. The time-saving ingenuities of the machine are not given a fair deal.

Fig. 2—Above, three-shelved truck used in factory. Below, compact method of storing armatures

Bearing these points in mind it is of extreme interest to note the floor plans and layouts of successful factories. Such a one is the new plant of the Electric Auto-Lite Co., Toledo, illustrated herewith.

This factory has a floor space of 2,500 square feet, having three floors with a basement, and measuring 120 feet on the long side by 75 feet wide. It is a plain, well-lighted rectangular brick structure as will be seen in Fig. 1. The machinery and facilities of this new plant are capable of turning out in the neighborhood of 30,000 complete starting, lighting and ignition systems a year, or over 100 every working day.

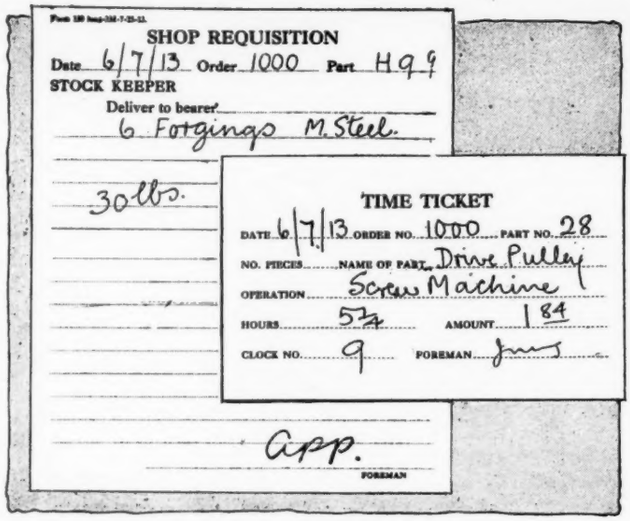


Fig. 3—Record forms used in Auto-Lite factory

Three of the floor plans are given in Figs. 4, 5 and 6. The basement is not shown. Taking the ground floor first, Fig. 4, it will be seen that the front is taken up with the two offices and the rear with a large walled-off section forming a paint shop. Between these is provided ample space for the accommodation of the punch presses and automatic machines which deal first with the raw material as it comes in on the ground floor. The punch presses are as nearly automatic in action as possible so the unskilled operator can tend them. They are furnished with dies for the rapid punching of armature and field magnet laminations. The paint shop with its baking ovens represents the final operation. After passing through this process the machines are packed on benches situated conveniently at the door and dispatched through the side exit shown.

Machine Shop Is Well Arranged

On the second floor, Fig. 6, are arranged two banks of lathes, those of the turret type occupying the entire side. All turning of armature shafts, gears, interiors of fields, etc., takes place here, as well as all drilling and milling operations, the motive power for the line shaft being supplied from two centrally placed motors. A large tool room is situated at the rear end of this floor. Assembled armatures and fields ready for winding and final assembly are passed up to the third floor, Fig. 5. This is the assembly department, half of the floor area being given to benches for this purpose. In the center is a stockroom for finished parts and there are besides a testing laboratory and the drawing office. After final assembly all generators and motors are subjected to efficiency and duration tests on this floor on benches adjacent to the elevator which carries them down to the ground floor for painting and shipping. In the basement, not shown, all raw material on hand is stored. There is also a carpenter shop, chiefly used for the woodwork in connection with shipment, in the basement and also a small forge. The remainder of the floor space is utilized for general storage. In addition to the arrangement in sequence of the various machines throughout the manufacturing processes it is equally important to see that a handy and quick means of transport is available between the machines and departments. In the Auto-Lite factory, since all the parts are small, a solution to the question is found in the use of a small shelved truck, Fig. 2, furnished with swivel wheels. These trucks are easily handled about the floor and elevator.

Storing of Parts Requires Care

Armatures present a somewhat difficult storage problem as the winding must not suffer from abrasion. The method adopted in the store room of the factory under consideration is shown in Fig. 2. Wooden frames 3 inches deep and wide enough to take the shaft are used. Each frame accommodates eight armatures, and placed on top of each other a convenient and compact storage box is formed. Handles are fitted to the ends of each frame.

All material drawn from the stock room is recorded on a blank, Fig. 3, and filed according to the order number. The exact number of hours spent on each factory operation of the order is also recorded, the time ticket shown in the same illustration being used for this purpose.

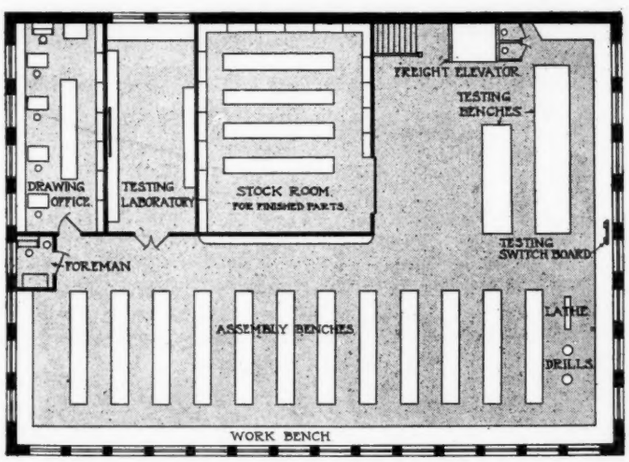


Fig. 5—Plan of third floor, showing stock room

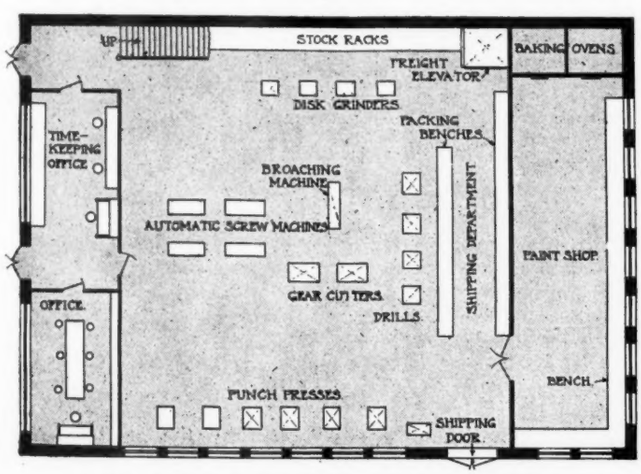


Fig. 4—Plan of ground floor of Auto-Lite plant

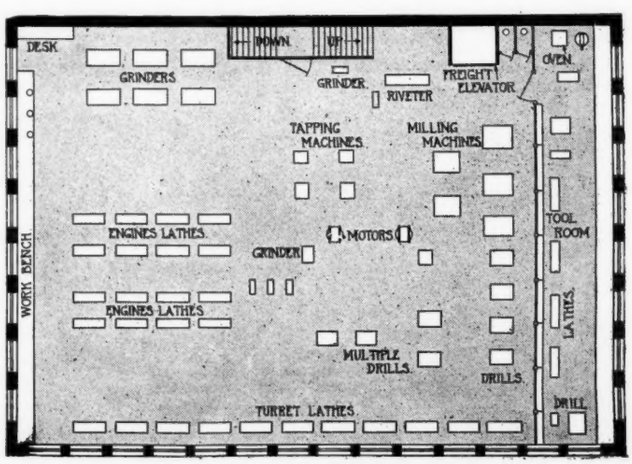
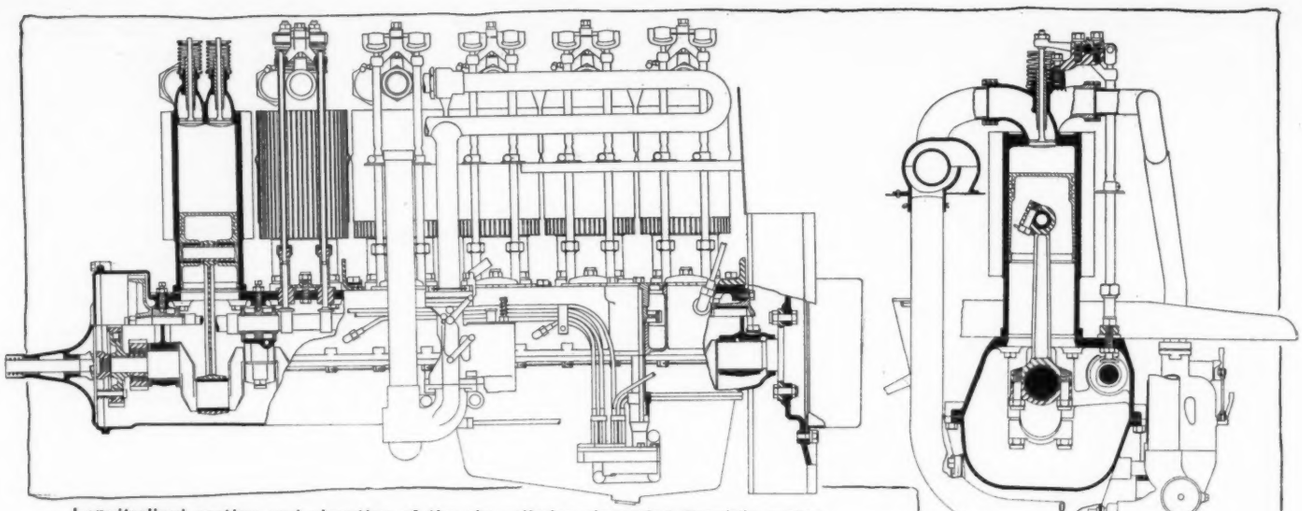


Fig. 6—Second floor, showing layout of machines



Longitudinal section and elevation of the six-cylinder air-cooled Franklin motor

Transverse motor section

Six-Cylinder Chassis Constitutes Franklin Line for 1914

ONE chassis with six different types of body constitute the entire Franklin line for 1914. The new series, known as the Franklin Six-30, incorporates a six-cylinder motor mounted on the light chassis which has always been a notable part of the Franklin design and upon which the different types of body are interchangeable. The Six-30 car is extremely light in weight, the touring type when fully equipped weighing but 2,700 pounds.

This concentration on one model has come after 13 years of manufacture of several different models each year. When 3 years ago the manufacture of commercial cars was discontinued, followed by dropping of the taxicabs, the one-chassis proposition was in view.

The Six-30 presents many constructional changes throughout. The basic Franklin principles are retained in every detail, such as light weight, direct cooling, wood sills and elliptic springs. The Six-30 has left drive and center control.

Motor Has Longer Stroke

The motor has been improved by fitting a compensating valve mechanism which takes care of the difference in expansion so that the clearances change but little as the motor becomes warm. The valve lifter rods are now inclosed, an improvement which gives a more quiet valve mechanism and provides a means of lubrication. The long overhead walking beam support which formerly went over all the cylinders has been eliminated, each cylinder now being an independent unit so that it can be removed and re-assembled without interfering with any other cylinder. The timer, magneto and generator gears are now located in the front cheek piece of the motor in the same housing as the silent chain of the Entz motor-generator.

The cylinders are cast independently and have a bore of 3.625 inches and a stroke of 4 inches. The valves are in the head of the motor and are operated by push rods and walking beams. The cylinders are air cooled according to Franklin practice and have independent vertical cooling flanges surrounded by metal jackets. The crankshaft is carried on seven plain bearings. The crankshaft bearings are carried on bridges and the upper part of the crankcase, which is divided in the plane of the main bearings. The crankshaft carries the flywheel by a flange and bolts.

The oiling system used on the car is the circulating force-feed type. Oil is taken from the oil reservoir in the lower part of the crankcase through individual leads to each of the main bearings and by way of a sight-feed located on the dash by means of which the oil feed through the oil leads can be watched. The oil is filtered when taken through the fine screen in the bottom of the small compartment from which the oil pump receives the oil. The oil pump is of the gear type. A hand operating on a quadrant having a cork float indicates at all times the amount of oil in the reservoir.

The electric system of the car comprises an Entz starting and lighting system and an Eisemann magneto for ignition. The Entz motor-generator is permanently connected to the crankshaft of the motor by a silent chain. When running at speeds above 12 miles an hour the generator is charging the battery as the motor generator at this time is acting in its generator capacity. At low speeds or in starting the motor generator acts in its capacity as an electric motor and drives the engine. The battery used in connection with the starting and lighting system is an 18-volt Willard located under the tonneau floor. This battery operates the cranking, motor and lighting system.

The starting switch of the Entz electric starting system is small and easy to get at, being placed horizontally instead of vertically on the dash. There is a resistance on the electric horn. All lighting switches are all located in a box dividing the front seats. In this box provision is made for carrying five extra light bulbs.

Simple Gasoline System Used

The gasoline system consists of a gravity tank and Franklin type of carbureter located on the left side of the motor. The gasoline tank is located under the front seat and has a capacity of 14.5 gallons. The reserve tank has a capacity of 2.5 gallons. Throttle is controlled in the customary manner by a lever mounted on top of the steering post and an accelerator.

The pointer for the hot and cold air adjustment for the carbureter is on the dash and has three positions marked on its dial: Start, on and off. When the pointer is turned to start the air passage is practically closed so that a relatively large amount of gasoline is drawn into the intake of the engine and a rich mixture is obtained, thus giving easy starting in cold weather. The cold air pipe to the carbureter runs direct to the carbureter instead of under the engine, so that the air may be cold enough.

The gasoline valve and separator are all together in one fitting fastened to the bottom of the gasoline tank and the handle for operating the same is on top of the tank under the driver's cushion. The valve provides a main, reserve and closed position, and having the handle under the cushion makes more or less of a lock of it. This arrangement gives one large strong gas pipe from the tank directly to the carbureter, eliminating all possible chance of air pockets. On the sedan a large cylindrical tank is carried on the rear of the sill.

The clutch is a multiple-disk running in oil and is housed in the flywheel of the motor. The clutch trunnion is lubricated with graphite grease from a cup located on the sill with a handle on the outside of the frame.

Gearbox is mounted amidships in the same manner as in former Franklin models, no important changes having been necessitated by a shift of the control mechanism from right to center control. The gear reduction on direct, which is on third, is 3.71 to 1. This reduction is standard and is put on all chassis. The gearshifting mechanism and emergency brake levers are mounted in a housing which is integral with the gear case cover, giving a compact and light construction. In the cover of the gearcase is located a filler plug which also acts as a breather, preventing leakage of oil at the bearings.

Six Body Types Made

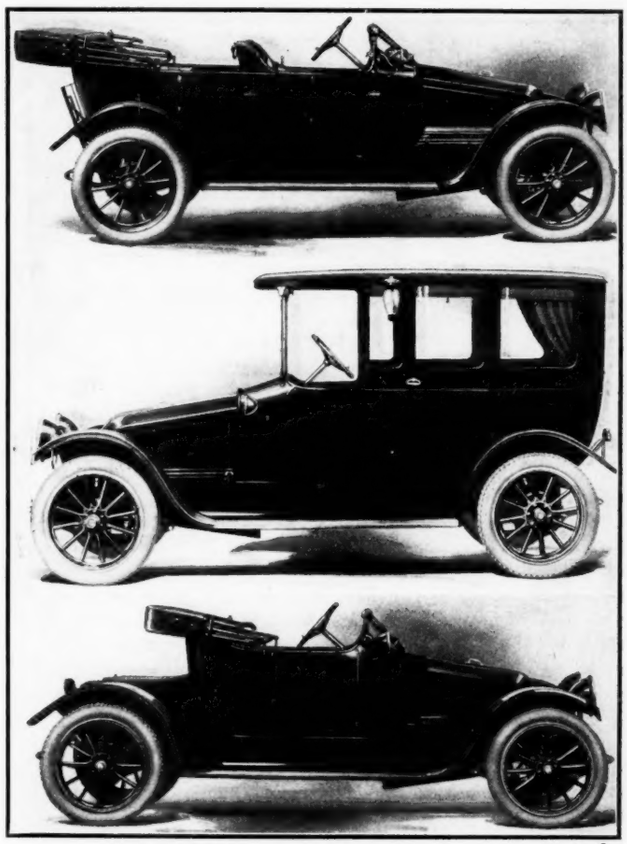
The type of rear axle used is the semi-floating bevel gear type, using a differential assembly with bevel pinions. The differential and pinion shaft are carried on roller bearings. Taper roller bearings are used throughout and are adjustable so that wear may be compensated for. All gears may be removed without tearing down the axle, and it is possible to see all adjustments as they are being made so that they can be better gauged. Taper fits are used throughout the drive system. The rear axle gearcase is made of aluminum with a very large strong section well ribbed. There is no brazing used, as all parts fastening to the rear axle tubes, such as spring chains and brake carriers, are riveted or spot welded and pinned.

The general body lines of the Six-30 have been refined and careful attention to every detail gives a clean, unbroken body. The running boards are clear and the toolbox is carried between the running board and the sill, folding down on the running board when open. A few of the small tools are carried in the pockets of the front doors. Slightly domed top and side panels of the sloping hood have added considerably to the car's appearance. Wheelbase is 120 inches and tread 56.

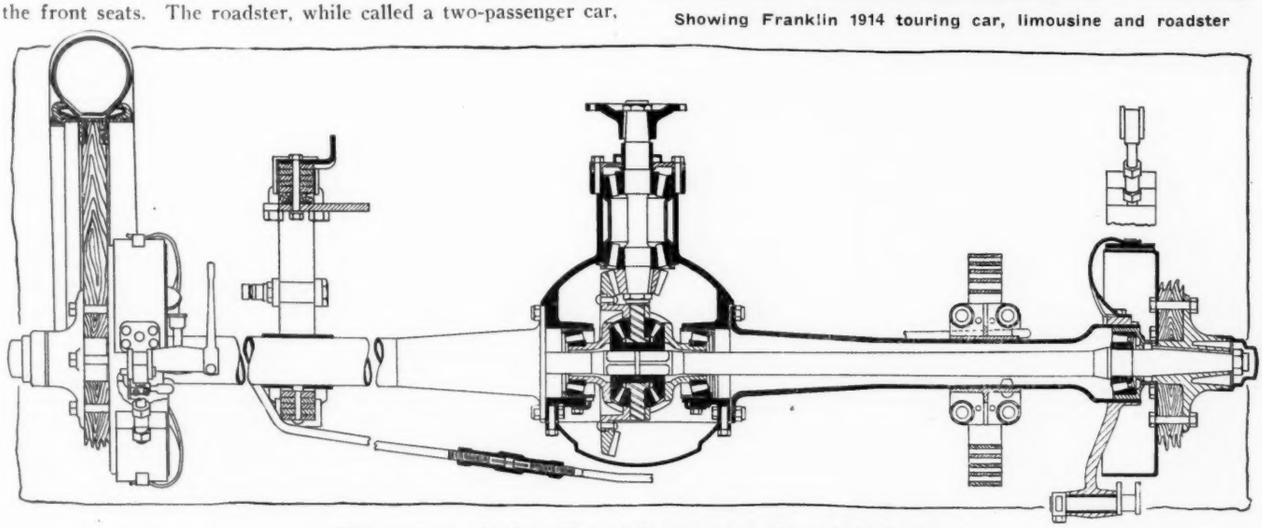
The standard color on all bodies is Brewster green with black trimmings. Tires are 34 by 4.5 inches with non-skid rear.

The touring car seats five, three on the rear seat, which is 48 inches wide, and two in front. There is no division between the front seats. The roadster, while called a two-passenger car, has accommodations for four people. The total width of the front seat is 45 inches and the driver's part of the seat is 7.25 inches ahead of the rest of the seat. Three people can sit on this main rear seat, and a small auxiliary seat in the corner in front of the passengers' seat accommodates the fourth. There is no auxiliary rumble seat in the rear. The coupé seats three on the main rear seat with a small auxiliary corner seat, the seating arrangement being exactly the same as on the roadster.

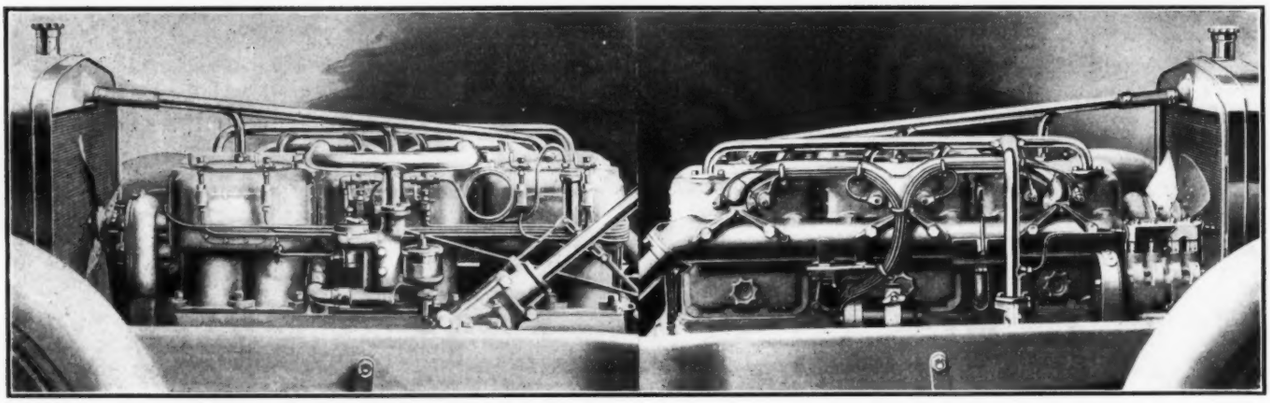
This same seating arrangement is found in the Berlin and the auxiliary seat has two positions, one position in the middle facing the rear seat and the other on one side facing forward. The prices are: Five-passenger touring, $2,300; two-passenger roadster, $2,300; coupé, $2,950; sedan, $3,200; limousine, $3,300; Berlin, $3,400.



Showing Franklin 1914 touring car, limousine and roadster



Rear system, showing differential rear axle springs, brakes, etc.



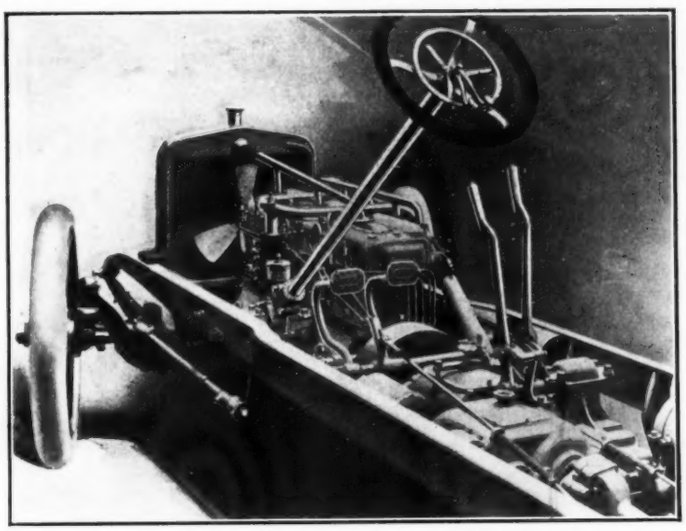
Left and right sides of Winton six-cylinder 1914 motor, showing manifolds and details of wiring

Winton 1914 Motor Has Longer Stroke

Left Drive, Center Control, Lowered Body and Tire Pump New Features This Season

WINTON Model 20 cars for 1914 will be distinguished by their lower appearance by a slightly more powerful motor, improved suspension and by the addition of useful accessories and an improved finish.

The stroke of the piston has been increased from 5 to 5.5 inches, the drive has been shifted from the right to the left side of the car and the control levers are now placed in the center. The car has been dropped 3 inches as compared to 1913. The spring suspension has been made easier and the radius rods have been dropped, the drive being taken now through the rear springs. A stiffer and heavier frame is used in the new car and a Kellogg automatic pump has been fitted to keep the air pressure tank supplied for starting and for the inflation of tires. For easy starting a primer, fitted on the cowl board, is supplied and the carbureter is now heated by a hot-air tube. The air is taken from around the exhaust pipe. All the dash instruments are mounted on a cowl board. A notable feature is the absence of side lamps, their function being filled by small auxiliary lamps mounted in the headlights.



Quarter plan view of motor, clutch and gearset assembly

Cylinders Are Offset

The Winton motor has six cylinders with a bore of 4.5 inches and a stroke of 5.5 inches, giving an S. A. E. rating of 48.6 horsepower. The cylinders are cast in pairs with integral water-jackets, which are tested in manufacture by hydraulic pressure of 300 pounds to the square inch. The cylinders are offset from the crankshaft, the Winton engineers figuring that this construction saves them 50 per cent. of the wall thrust on the explosion stroke. The material used in the cylinder castings is close-grained gray iron.

The pistons are of the three-ring type, all rings being located above the wristpin. The wristpin is carried in the end of the connecting-rod and works in a heavy boss in the piston.

In the manufacturing work the pistons and rings are lapped in their respective cylinders and before assembly each set of pistons, rings, connecting-rods and wristpins is weighed to secure accurate balance.

The valves are all 2 inches in diameter, are carried on one side of the motor and are made of nickel steel. The entire valve action is inclosed by non-resonant steel plates to cut down valve action noises and to assist in perfectly lubricating the valve action. The entire camshaft and cams are forged in one piece. The profiles of the cams are designed to give a flow of gas of exact proportion to the piston speed. The camshaft bearings are ground and the entire camshaft can be removed through the front of the crankcase without interfering with the valve adjustments, valve springs, push rods or rollers.

The timing gears operating the camshaft, magneto and fan are composed of semi-steel and have a spiral pitch. The crankshaft is of heat-treated nickel steel having a tensile strength of 125,000 pounds to the square inch. It is carried on four main bearings, each of which is bushed with Parsons white bearing metal. The bearings are ground to fit.

The crankcase is of aluminum and is divided vertically into two. The left and right halves are removable and when taken off provide a method for the quick removal of the crankshaft, connecting-rods or pistons without the necessity of disturbing the cylinders, carbureter, magneto, water pump, etc. The crankcase is designed for accessibility and when one side is removed it permits the operator to readily reach any one of the main or connecting-rod bearings.

Forced Lubrication Used

The lubrication used on the Winton motor is a circulating force feed. There are two pumps used in the system, one of which takes the oil from the reservoir on the right side of the motor to the bearings and the other returning all the excess oil to the reservoir, which has a capacity of 6 quarts. Both pumps are driven from an eccentric on the rear end of the crankshaft. The pump taking the oil from the tank delivers it

GRIPPER AND SIDE GUIDE

through tubes to the main bearing of the crankshaft and to the front gears. From that point the oil drops by gravity into the crankcase. The second pump draws the oil from the crankcase and returns it to the tank, where it is strained before being used again.

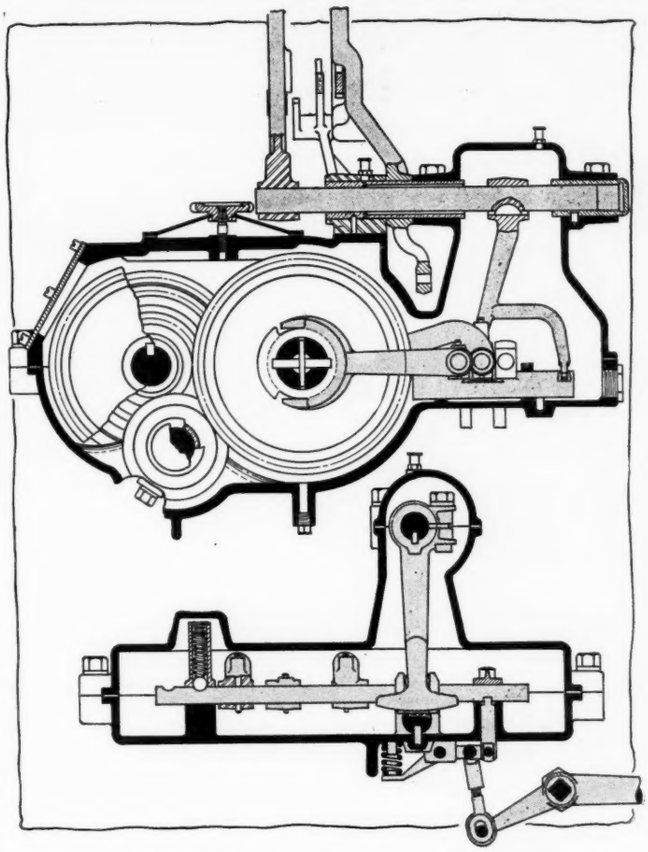
Cylinders, cams and camshaft bearings are lubricated by splash from the connecting-rods. This is the oil that overflows from the bearings to which it is led by the force feed pump. The excess oil is drained from the splash troughs by the second pump, which takes it back to the tank. There is always enough oil left in the crankcase, however, to provide a plentiful splash from the connecting-rods to the parts oiled by this part of the system.

Auxiliary Tank Under Cowl

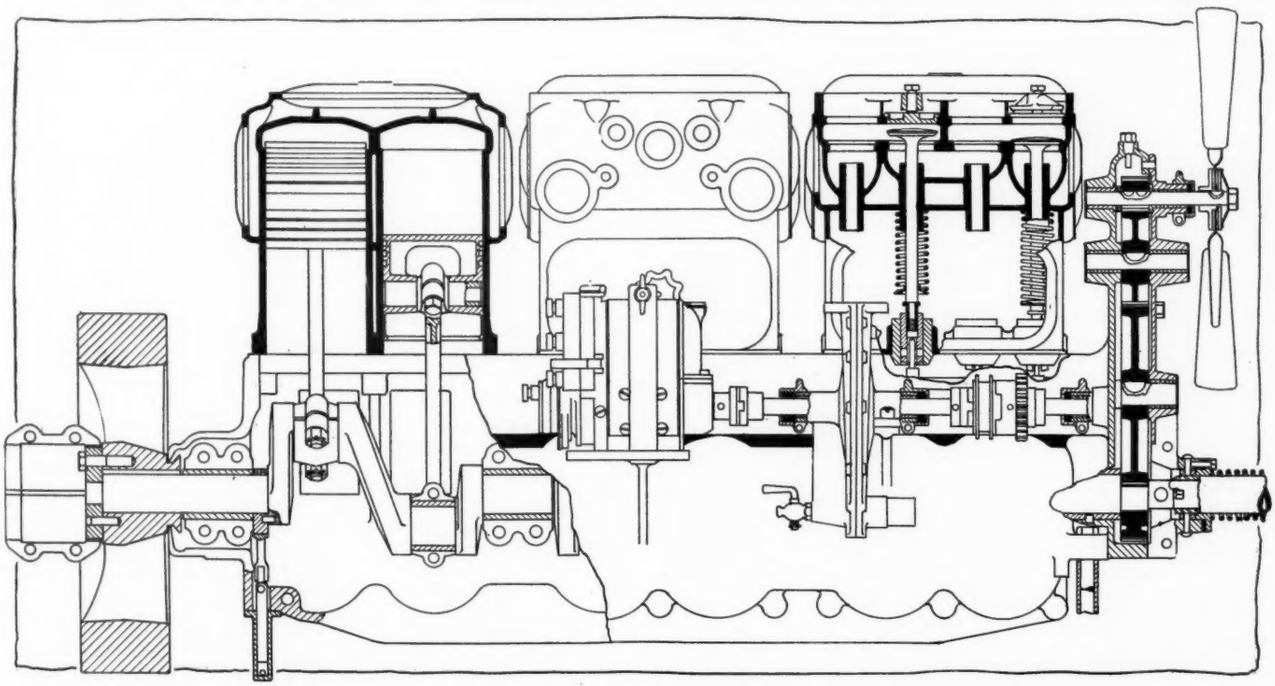
The Winston gasoline system is illustrated on page 704. It consists of a pressure tank of 22-gallon capacity, a special form of the Stromberg carbureter known as the Winton Stromberg, having two air nozzles and a gasoline primer, which operates from an auxiliary tank and is controlled from the cowl board. Gasoline flows under a 2-pound pressure from the main tank, carried at the rear of the frame below the body, to the auxiliary gas tank mounted between the cowl board and the dash. From this tank the gasoline flows by gravity to the carbureter. This arrangement eliminates the necessity of pumping the fuel by hand and prevents any chance of the fuel backing up into the air tank. The main tank has a 3-gallon reserve compartment which cannot be drawn upon without notice to the driver that the main supply is gone. This is accomplished by having a standpipe in the main tank with a two-way cock, which must be turned in order to draw the gasoline below the level of the top of the standpipe. All the gasoline passes through a strainer before entering the carbureter.

Ignition is accomplished by dual system, using either the Mea or Bosch dual magneto, with storage battery to supply auxiliary current for starting, etc. The spark control is from the steering column in the usual manner and the control switch is located on the single coil, which extends through the cowl board. Magneto is carried on the right side of the motor on a platform which is a part of the crankcase casting. It is strapped in position and is quickly removable by turning the wing nut, which fastens the strap, and disconnecting the Oldham coupling between the magneto and the pump. The spark-plugs, which are of the 7-8 inch S. A. E. standard size, are mounted horizontally in the cylinders directly over the intake valves, the object being to have them swept by each fresh charge. The wiring is connected in insulated holders, bracketed on the cylinder.

The drive is transmitted to the motor by a multiple-disk

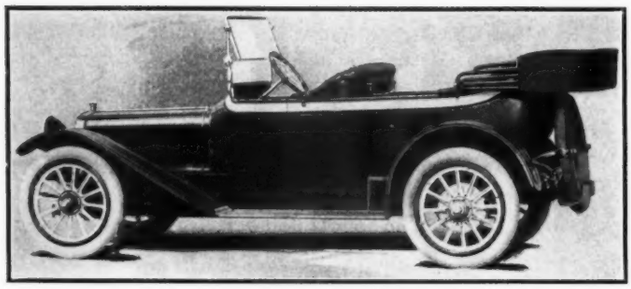


Details of sliding, selective gearshifter mechanism

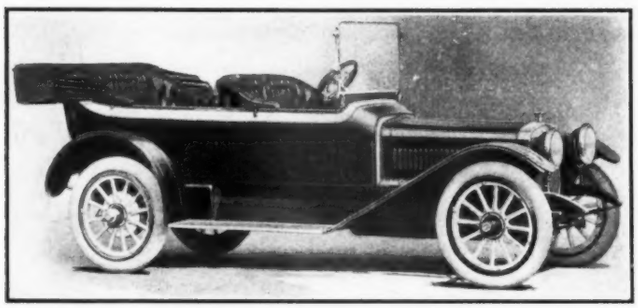


Part sectional and elevational view of Winton six-cylinder motor, showing cylinder and valve design

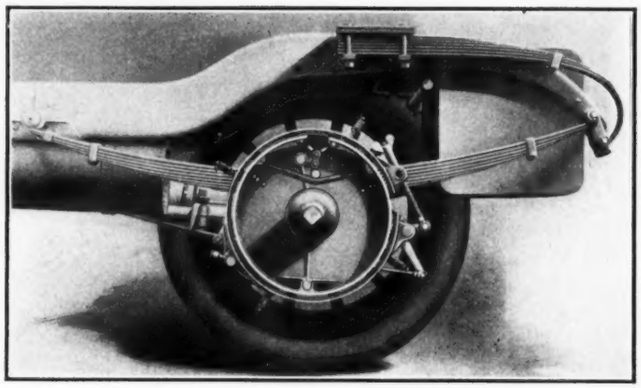
GRIPPER AND SIDE GUIDE



Direct side view of standard five-passenger touring car



Front quartering view of touring car, showing seating arrangement



View of spring mounting and interior of brake

clutch having sixty-three high-carbon-steel disks. Thirty-two of these disks are attached to the mainshaft and thirty-one to spiders driven from the flywheel. The bearings carrying the gearset shafts are S. K. F. self-aligning ball bearings of the double row type. The tension on the clutch is maintained by four spiral springs spaced at equal distances around the circumference distributing tension equally on all the disks. The clutch is contained in the gearbox and is accessible from a hand hole on top. A slightly greater clutch release is given this year than last, eliminating all possibilities of dragging when the clutch is disengaged.

Four Forward Speeds

Four forward speeds and reverse are given, direct drive being on third speed. Gear ratios are 3.69 to 1, 3.43 to 1, 3.2 to 1 and 2.64 to 1 on direct drive. The changing of the control from right to center has not caused any change in design as to the gearbox mechanism, the only changes noticeable being in the control levers and shifter mechanism. Interlocking devices make it possible to enter neutral gear when the clutch is engaged, but not to make any new gear engagements until the clutch pedal is depressed.

The driveshaft has a universal joint at both the front and rear ends. The cross type of universal joint is used at the front end and the roller type at the rear end. The car is so designed that under normal loads the driveshaft should be horizontal. The cross type universal joint at the forward end of the driveshaft is internally lubricated and the rear universal joint is inclosed in a grease-tight metallic case. Between the motor and the clutch is a long coupling which engages a steel square bolted to the flywheel and a similar square on the forward end of the clutch. The rear axle is of floating type as is shown on this page. It is carried throughout on Timken roller bearings. Differential is of the spur type, and the gears and pinions are of hardened nickel steel. A torsion rod extends from the rear axle case to a cross member of the frame. It is of circular section and relieves the driveshaft of the strain due to a tendency of the axle housing to rotate around the axle. At its forward end the torsion rod carries a link with a ball joint, allowing a limited freedom of movement.

The wheels are of the 12-spoke artillery type, 36 inches in diameter and are carried throughout on Timken roller bearings. Demountable rims are fitted and the tires are the 36 by 4.5 inch size. The tires are inflated by a four-cylinder Kellogg air pump mounted at the right forward end of the motor and controlled from the seat. A tube supplied with the car can be attached at one end of the air cock on the inside of the dash and at the other end to the tire to be inflated. The tire can be inflated to 90 pounds pressure in 3 minutes.

Steering is by a screw-and-nut mechanism carried on ball bearings giving a practically horizontal connection between the steering gear and left front wheel. The steering knuckles are carried on roller bearings and adjustments can be made in the steering links.

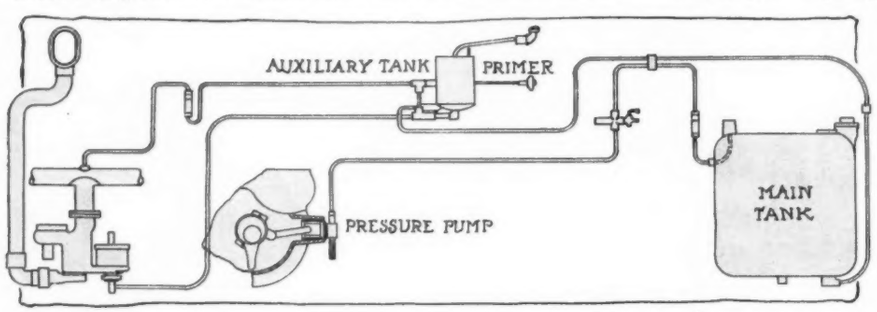
Control features are mounted in positions accessible from the driver's seat. The lever nearest the driver's right hand operates the gearshift and the second lever applies the internal brakes. The brake lever can be locked in any position. Both these levers are attached to the gearbox and not to the frame of the car. The brake sizes are 14.375 inches in diameter by 3 inches in width for the service brake and 14 inches in diameter by 2.375 inches in width for the emergency.

Instruments on Cowl Board

Spark and throttle levers are mounted on the steering column and operate on a ring having a tapered annular groove. Springs force tapered plungers carried by the spark and throttle levers into the groove giving sufficient friction to keep the levers in whatever positions they may be placed. The button accelerator and the Kellogg pump pedal are operated by the driver's right foot.

The standard body is a five-passenger streamline touring car. Any other type body is made on order.

A complete electric lighting system, with Gray & Davis dynamo and 80-120 ampere hour Willard storage battery is furnished with a complete air starting system, with two sources of power—motor cylinders and water-cooled Kellog pump.



Tank arrangement and piping plan of the Winton gasoline system for 1914

Light Motors Show Efficiency and Power

High-Speed Motors Developed in Recent Years Show Low Weight Per Horsepower

By E. H. Delling

NEW YORK CITY—Editor THE AUTOMOBILE:—In the last few years a new type of engine has been developed and used in racing competitions, the "high-efficiency" or better, "high-speed" motor. I think this type of motor is going to supersede the present types also for touring car work, the same as it has done in Europe, and it therefore seems timely to describe the main features of these motors, at the same time showing the difficulties which have to be overcome in developing them.

Why the High-Speed Motor

First, let us analyze the reasons why the high-speed motor is more desirable than the older type. The ability of a car is governed chiefly by the horsepower available at the rear wheels, the total weight to be moved, and the wind resistance.

For a better illustration of the points, actual figures and performances of the latest design of the writer, the Deltal car will be used solely because I have the facts at hand. This motor has four cylinders, 4-inch bore and 5 15/16-in. stroke, rated at 25 horsepower at 1,000 r.p.m., S. A. E. formula. It weighs 570 with carbureter and magneto. The weight of the car in racing trim is 2,300 pounds, a figure that can hardly be brought down by an appreciable extent. The weight of the car being constant it leaves the power of the motor as the only expedient to increase the speed of the car.

We now will investigate which factors influence the power of a motor. Horsepower is the conventional way of measuring work to be done. Work is the product of a certain force and the distance covered. In an internal combustion engine the force is represented by the mean effective pressure on the piston, and the distance covered by the piston per minute.

How to Increase Power

The old way of increasing the horsepower of a motor was simply to increase the force on the piston of the engine, namely, to increase the size of the engine without altering the piston speed. This not only increases the weight of the motor itself considerably, but also necessitated heavier parts in the clutch, gearset, universal joints and propeller shaft, owing to the increase in the torque of the motor.

In the high-speed motor, the additional horsepower is obtained by increasing the other factor of the horsepower formula, the piston speed.

If we formerly could obtain 25 horsepower from a motor of 4-inch bore, we can now exceed 75 horsepower by raising the piston speed from 1,000 r.p.m. to 3,000 r.p.m., without having to increase the dimensions of the above named parts, as the torque of the motor remains practically constant, regardless of the number of revolutions. At the same time, a high-speed engine has the advantage of better thermal efficiency, as it is mostly running with a comparatively open throttle and, therefore, higher compression. This in turn means low gasoline consumption, a very desirable feature.

Higher Piston Speeds

The question arises: How far can we increase the piston speed? It is amusing to read the ideas that authorities had only a few years ago in regard to this point. A mean piston speed of 1,500 feet per minute was considered the absolute limit even for a short time. Nowadays we do not hesitate to run a motor continuously at piston speeds well above 2,000 feet. In bench-testing this motor an endurance run was made for 8 hours with wide-open throttle and a high load to bring the motor down to 2,200 r.p.m., which is equal to a piston speed of 2,200 feet per minute, and not the slightest trouble was experienced. This, it must be remembered, with the motor in the car geared 2.5 to 1 is equal to a speed of 85 miles per hour, going slightly upgrade. The distance covered in 8 hours would be about 680 miles. That, however, does not represent a very high piston speed by any means, short runs having been made up to 3,250 r.p.m. with the same motor, averaging a piston speed of 3,200 feet per minute. Even at that speed the maximum had not been reached, but trouble was anticipated with the fan dynamometer, owing to the tremendous centrifugal force.

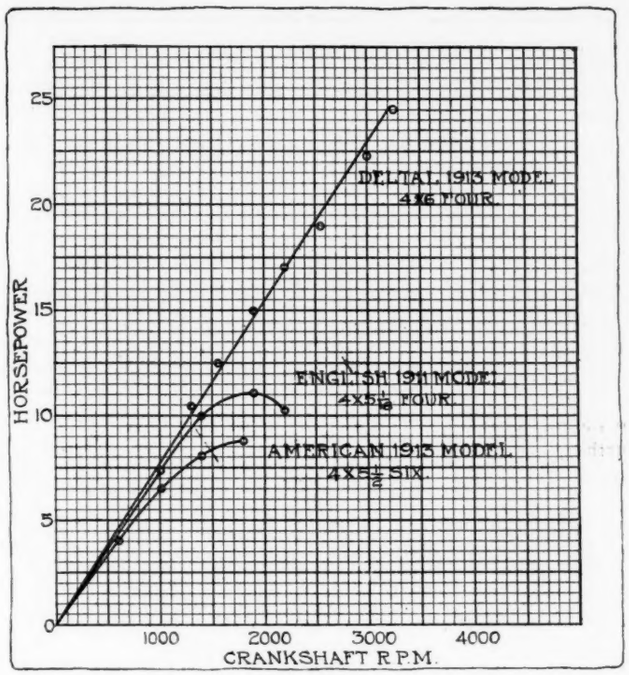


Fig. 1—Comparative horsepower curves of American, English and Deltal motors

This proves that we can raise the power of a motor in practically direct proportion to the piston speed without increasing the weight. However, in order to obtain maximum efficiency we have to trace every loss of power and eliminate it wherever possible.

The M. E. P. Factor

We have seen that the power output of a motor depends also on the mean effective pressure, abbreviated m.e.p., and we will now investigate the factors that influence the m.e.p. The general opinion prevails that the valve timing and the shape of the combustion chamber are largely responsible for high m.e.p. Many people even believe that racing drivers use special secret valve timings. Strange enough, it has been my experience that even **very pronounced changes in the valve timing have little influence on the power output and speed of the motor, an early exhaust opening and a very late intake being practically all that is necessary.** A change of 10 degrees on the flywheel makes hardly any difference.

Racing Motor Valve Timing

I notice that numerous inquiries have been made by readers of THE AUTOMOBILE regarding the valve timing of a racing car, and for their benefit the valve timing of the Deltal motor is given here.

The exhaust opens 68 degrees before dead center and closes 8 degrees past dead center. The intake opens 20 degrees past dead center and closes 48 degrees past dead center.

The motor has this timing now, not because it showed the best results, but for the simple reason that this happened to be the last camshaft tried, and as it gave practically the same results as the others it was left in the motor.

The writer had always been anxious to settle this timing question, but had never been connected with a firm that cared to go to the expense of making up several sets of expensive master cams. My car, however, was built and financed by its designers, P. F. Hackethal and the writer, and we thought it of sufficient importance to make camshafts with four different timings. The results were as expected, the horsepower curves being nearly identical in spite of the fact that one camshaft had an overlapping exhaust closing and intake opening of 5 degrees, radically different from the one given.

Furthermore, the shape of the combustion chamber is, in the opinion of many designers, of great importance, the spherical shape representing the ideal of all valve-in-head advocates. A great gain of power is claimed by this valve arrangement, one authority, Enrico Giovanni of the Fiat company, stating that an increase of 20 per cent. was observed, compared with the T-head motor. The writer has never found this, but has obtained m.e.p. well over 95 pounds at high speed with this motor, and could hardly imagine anything less spherical than the combustion chamber of that motor, which is shown to scale Fig. 2. However, the shape of the combustion chamber probably has a slight influence on the thermal efficiency, and the compression in a compact combustion chamber need not be quite as high.

This point also leads to the question of valve arrangement. Being a strong advocate of the L-head motor, I think the old objection of the small valves of such motor is ridiculous, as a glance at the sketch will show that a motor with 4-inch bore has 2 13/16-inch valves, which, in comparison with the bore, is probably larger than any T-head motor ever built in this country. The extra length of an L head motor of such proportions is absolutely necessary to provide adequate bearing surface for the high number of revolutions and high inertia stresses due to the weight of pistons and connecting rods.

Gas Supply Limits Horsepower

The question has often been raised, What limits the horsepower output of a motor? The reason is almost every time the inability of the motor to draw in a full charge of gas, and this inability is shown distinctively in the horsepower curve of any of the regular motors now in use. As a rule, the horsepower curve drops around a speed of 1,600 r.p.m., on account of the low volumetric efficiency. To illustrate this point, the horsepower curves of two cars of the United States and England are shown below in comparison with the Deltal motor. One of these is the Knight sleeve-valve variety, the other an L-head poppet valve six of recent design. The sleeve-valve motor should theoretically develop more power and speed than any of them, owing to the extremely large port openings, but unfortunately it cannot realize this power and speed for other practical reasons. The curves are for 1 litre or 61 cubic inches of piston displacement and afford a direct comparison of the horsepower output of each motor.

Volumetric efficiency is the ratio of the volume of gas taken on the inlet stroke at a certain speed to the theoretical piston displacement of one cylinder. At low speeds this ratio is in the neighborhood of 80 per cent., and it is obvious that this ratio must be maintained up to as high a speed as possible to show extraordinary results.

Size of Intake Valves

This leads us to the most important point in high-speed motor design, that is the size of the intake valves and ports. It is easy enough to get rid of the exhaust gases, because the piston will literally shove them out, but it is very much harder to make the gas enter the cylinder, as only the comparatively low pressure of the atmosphere, 14.5 pounds, is pushing it in. Furthermore, the difference in pressure between the atmosphere and the inside of the cylinder must be as low as possible to secure high volumetric efficiency—certainly not over three-quarter pound. This difference in pressure is necessary to overcome the resistance of the carbureter, intake manifold and valves, and **in order to offer the lowest possible resistance these parts should be made extremely large.**

It is easy to comply with this rule regarding carbureter and intake manifold, but great difficulties arise in the operation of a large, and therefore heavy, valve at high speed. This, in the writer's opinion, is the limiting factor of high speed engines.

An examination of the valve mechanism of the Deltal motor will prove the difficulties and high spring pressure needed to close large valves at high speed. This motor is laid out for a speed of 3,000 r.p.m.; the valve tappet, valve spring washers and one-half of the spring weigh 0.9 pound. The lift of the valve is as high as the combustion chamber permits, namely, 1-2 inch. The cams are laid out for a uniform acceleration and deceleration during each 1-4 inch of the lift, giving a full opening during 50 degrees of cam motion.

At a cam shaft speed of 1,500 r.p.m., the time required to give a complete opening or closing is

$$t = \frac{60 \times 25}{1500 \times 360} = .00277 \text{ second.}$$

Since the acceleration

$$a = \frac{21}{t2}$$

, we have for its value here

$$a = \frac{2 \times 0.25}{.00277^2} = 65{,}000 \text{ inch pounds per second,}$$

or a = 5,410 foot pounds per second.

To impart an acceleration "a" to a weight "W," a force F is necessary of the value

$$F = \frac{0.9 \times 5{,}410}{32 \times 16} = 150 \text{ pounds.}$$

This represents the pressure of the valve spring when the

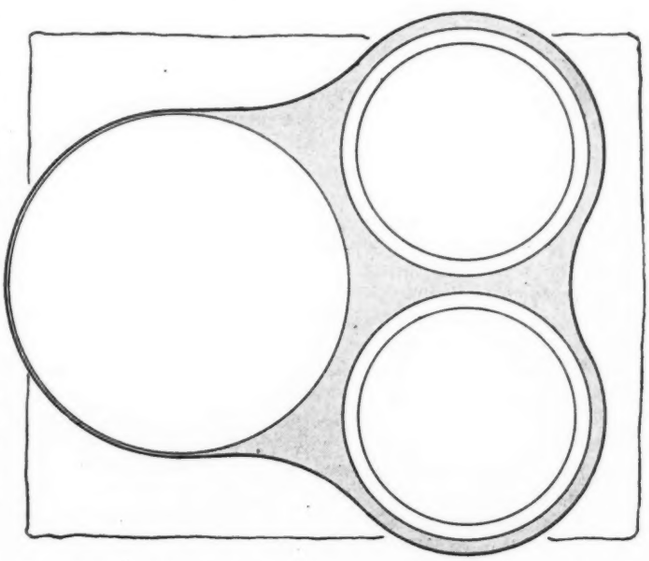


Fig. 2—Section through combustion space at right angles to axis of cylinder

valve is half-way down. Supposing that the exhaust valve opens when the pressure in the cylinder is about 40 pounds, this will give an additional pressure of $6.2 \times 40 = 250$ pounds, so that a total resistance of over 400 pounds has to be overcome by the valve-lifting mechanism. And it is very hard indeed to design a valve tappet that will be light enough to come within the weight limit given above, and yet be strong enough to withstand the severe stresses placed upon it.

Essentials in High-Speed Motors

We have found ways and means to obtain high m.e.p. and a high number of revolutions, and the next step would be to take care of these in the design of a motor. The outstanding features of high-speed motors are: Five-bearing crankshaft with liberal bearing surfaces, block cylinders, light reciprocating parts, a high-pressure oiling system and fewness and simplicity of parts in general.

A five-bearing crankshaft is the only way to obtain the required stiffness. The shaft must be extremely rigid so as to prevent whipping in the main and connecting rod bearings, as this would upset all calculations in regard to available bearing surface. The diameter and the arms of the crankshaft must be a great deal stronger than ordinarily, to avoid twisting of the shaft, due to the high explosion pressure, as a twist through even a very small angle will mean serious vibrations.

It is next to impossible to obtain a rigid aluminum crankcase supporting the shaft, and the writer therefore prefers a block cylinder for this, among many other reasons, so that the crankcase is not supporting the cylinders, but that the cylinder is suppotring the crankcase, thanks to the stiffness of the block casting.

Light Reciprocating Parts Needed

Light reciprocating parts are desirable for two reasons: First, in order to obtain a high number of revolutions, and, second, to reduce the bearing pressures. The steel pistons of the Deltal weigh only 1 pound 11 ounces, and the connecting rods 2 pounds. In touring cars with 4-inch motors pistons weigh approximately 4 to 5 pounds without rings.

It may be worth mentioning that not only the piston pin end of the connecting rod has to be light, but also the crankshaft end. Only recently the writer met with the erroneous opinion, when the chief engineer of an automobile concern made the statement that the lightening of the crankshaft end of a connecting rod was found by him "to be of no value." A few burnt-out bearings in racing soon demonstrated the value of light big ends. **A mathematical investigation will show that at those terrific speeds the inertia forces can exceed even the explosion pressures, and they, together with the centrifugal force of the connecting rod big end throw high additional loads on the bearings.**

The lubrication of these bearings is of prime importance. Only the force oiling system which passes a large quantity of oil through the bearings has been found satisfactory by the writer. The pressure can be varied from 0 to 60 pounds, but the motor is run regularly on about 40 pounds, all bearings, even the camshaft bearings, being flooded under this pressure, although not one external pipe is used. A great problem is the difficulty to keep the oil out of the cylinders and from getting by the pistons. The Deltal motor in the recent Elgin races proved the car never showed a trace of smoke in the exhaust, and consumed only 3 1-4 gallons of lubricating oil in 301 miles, covering stretches at the rate of 93 miles per hour.

Simplicity the Slogan

Simplicity and fewness of parts are very desirable in touring car engines, but they are absolutely necessary in high-speed motors, and this is another reason why I am an adherent of L-head motors. I could never see the reason for multiple valves, complicated overhead valve mechanism, etc. Even the T-head motor seems to be an unnecessary complication on account of its second camshaft with the necessary bearings and driving mechanism, especially so when the modern silent chain is used.

The last item of great importance in a high-speed motor is the balancing of all moving parts. The weight of the pistons and connecting-rods has to be within one-half ounce, and the crankshaft as well as the flywheel and clutch must be balanced accurately on a Norton balancing machine, as this machine insures perfect running balance. These features may be a slight expense to the manufacturer, but they are a blessing to his customers, as it is really delightful to ride in a car at a speed of 50 m.p.h. and yet feel not the slightest vibration, thanks to the careful balancing of all parts in the motor. The writer thinks that this feature will bring a good many users of six-cylinder cars back to fours.

Value of Racing Experience

The value of racing has often been denied by some automobile companies, mainly for one reason: Because the concern in question had not the goods to be successful in competition. The value of building such high-speed motors cannot be realized by anyone who has not had similar experience. The firm building cars with high-speed motors acquires intimate knowledge of high-grade steels and their proper treatment; it also brings out a good many minor improvements which will be appreciated by the purchaser of their car, particularly if their racing cars are of stock design with only slight modifications.

Unfavorable to Racing Sixes

Although not within the scope of this paper, we might touch upon the question, why six-cylinder racing cars are very seldom built. The first objection is the length of the motor, which is practically 1 1-2 times as long as a four of the same piston displacement. This requires an additional length of wheelbase of approximately 10 to 15 inches, most objectionable in going through a turn, besides adding weight all around through a heavier and longer frame.

The weight of the motor itself is also greater than a four of the same displacement. Furthermore, the length of the crankshaft is objectionable, as the same would have to be extremely heavy to keep from twisting when an explosion occurs in one of the front cylinders with the flywheel offering considerable resistance to this sudden acceleration at the other end. And having nearly 50 per cent. more parts than the four, is another objection, if one desires fewness of parts. Another small item is the magneto drive, which, on a basis of 3,000 r.p.m. on a four, would have to do 4,500 r.p.m. on a six. The intake and exhaust manifold of a six-cylinder racing car are also of much more complicated design. And, of course, the mechanical efficiency of a six must be lower on account of increased piston friction.

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Trade Opportunities

Automobiles and Agricultural Machinery—An American consular officer in Western Europe reports that a business man in his district desires to enter into relations with American manufacturers of automobiles and agricultural machinery not already represented in that district. Correspondence should be in French. File No. 11,107.

Automobiles—An automobile dealer, who has established a garage in a city of northern Africa and who has agents in other cities, desires to secure the exclusive agency to sell automobiles in Algeria, Tunis, and Morocco, from two American firms manufacturing automobiles that are not already represented in those countries. The American consul who supplied this information writes that while not essential it is preferable that correspondence should be in French and that prices be stated in francs. It is preferred to pay for machines delivered at a local dock. The dealer is not yet prepared to furnish information as to quantities desired, packing, etc., but desires particulars, literature relative to cars, and conditions that would be acceptable to American firms wishing to be represented. File No. 11,155.

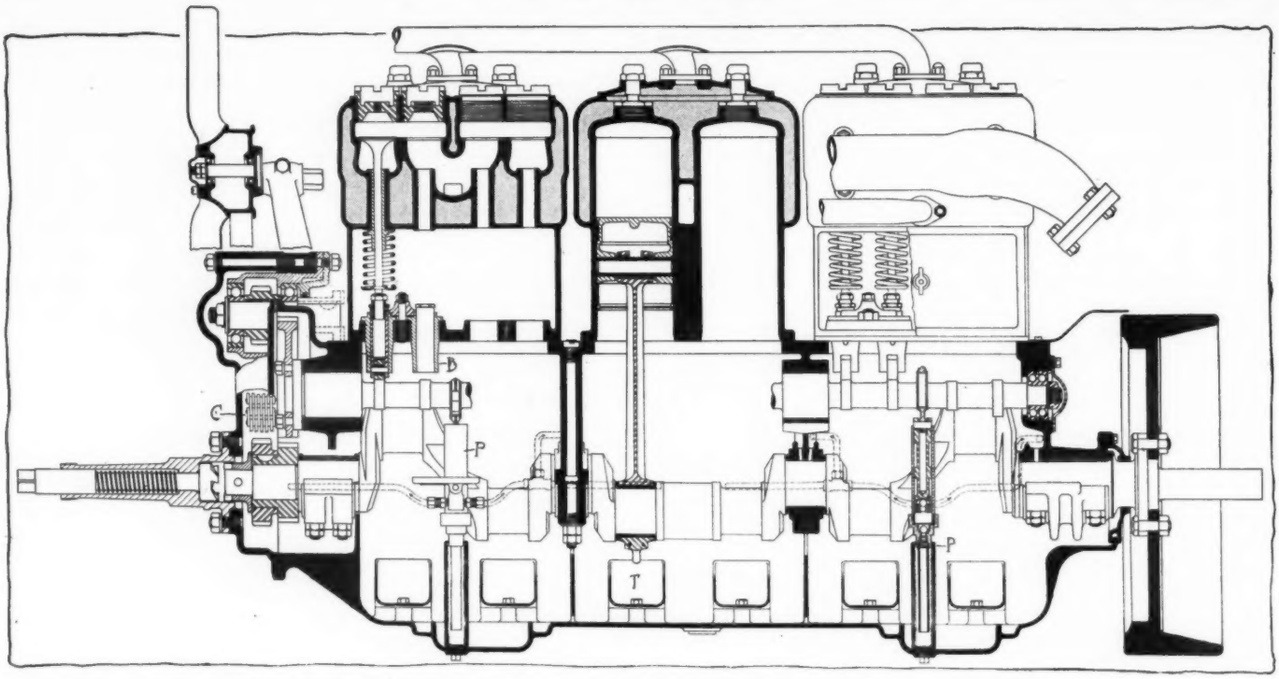


Fig. 1—Side section and elevation of the new Rutenber six-cylinder motor, showing pressed steel cover plates for inclosing the valves and removable valve stem guides

Rutenber Brings Out New Six Motor

Model 28 Has S. A. E. Rating of 33.75 Horsepower

THE Rutenber Motor Co., Marion, Ind., is marketing for 1914 a new six-cylinder motor known as model 28, and which is a development of its present six-cylinder design. The new motor, however, differs in many respects from the present one, although continuing as it does the leading characteristics of Rutenber construction. It uses L-type twin-cylinders as formerly but has discontinued the transverse shaft at the front end which drove the water pump and magneto, and on the new model these two members are mounted on the left side, the water pump at the front and the magneto in rear of it. The carbureter is on the non-valve side of the engine as in 1913 and the mixture is carried from the intake manifold to the opposite side of the cylinders through the water-jacket spaces by special cored passageways.

Displacement Is 348 Cu. In.

This new motor, bore 3.75 inches, stroke 5.25 inches, has an S. A. E. horsepower rating of 33.75. The company gives it a rating of 37 horsepower at 1,000 revolutions per minute, 49 horsepower at 1,500, and 53 horsepower at 2,100 revolutions per minute. It has a piston displacement of 348 cubic inches.

The crankcase design is built in two patterns, one in which the motor is looked upon as a separate unit, and the other in which the motor and gearbox are intended to form a unit, and in which case there is a bell housing inclosing the flywheel and to which housing the gearbox is attached. As an individual motor the weight is 765 pounds and built with a bell-housing for unit motor and gearbox, 790 pounds.

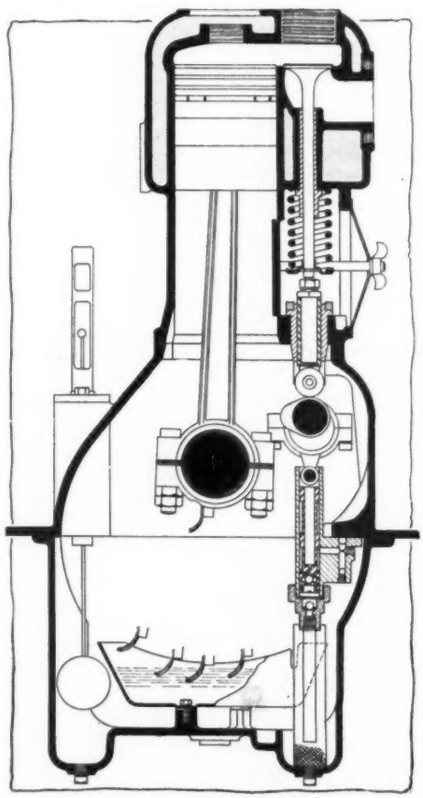


Fig. 2—End section through new Rutenber six motor, showing lubrication

Is for Three-Point Suspension

The motor is designed for three-point suspension in conjunction with standard main frame design.

The crankcase is cast in upper and lower halves, the upper supporting the crankshaft bearings and carrying the motor supporting arms and the lower portion incorporating the oiling mechanism.

This motor is regularly fitted with silent chain C drive for electric starter and generator to operate at the ratio of 1.5 to 1. These units will be mounted at the right front. The silent chain is entirely inclosed in a housing forming a part of that for the timing gears. On the right side of the upper half of the crankcase are two integral bosses from which pads may be built up to accommodate any standard starting apparatus. The crankcase is also designed to accommodate the

flywheel type of electric starter, in which event the starter shaft is used for driving the tire pump.

Fig. 1, a side section and elevation, shows the use of pressed steel cover plates for inclosing the valves, and also the removable valve stem guides. The nickel steel valve heads, 1.84 inches in diameter, are electrically welded to the carbon steel stems. Valve lifters carry hardened rollers which operate on hardened steel bushings B and pins, and are carried in bronze cages fitted into the crankcase. Large adjustable tappets with lock nuts are used.

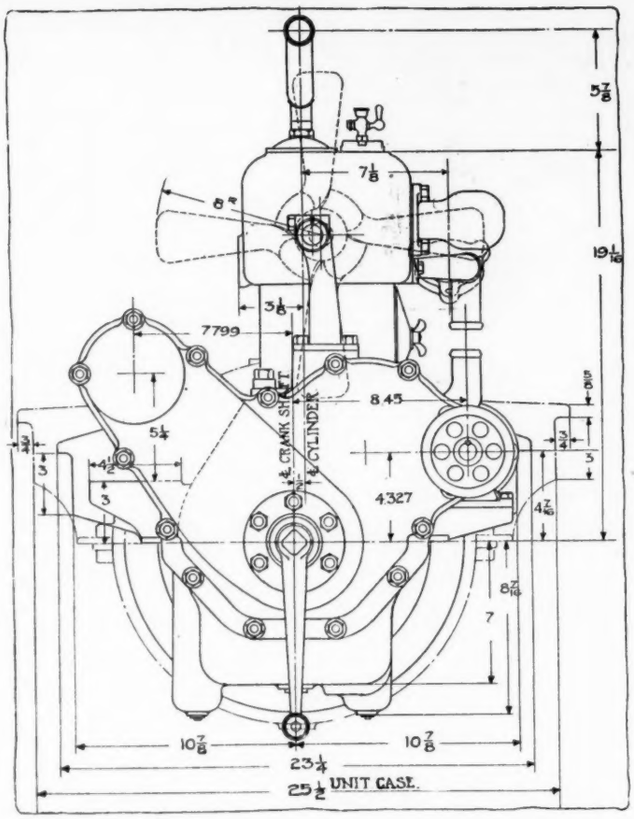


Fig. 3—Front elevation of new Rutenber model 28, six-cylinder motor, showing dimensions

Phosphor Bronze Bearings

Connecting-rods are drop forgings made from open-hearth steel, and are 12 inches in length. Phosphor bronze bushings are carried in the wristpin ends. The piston pin is .9375 inch in diameter. The lower connecting-rod bearings are 2.25 inches in diameter and 2 inches long.

The crankshaft, an open-hearth forging, is supported on four bearings; the front one 2.25 inches by 3; the two center bearings 2.25 by 2, and the rear 2.25 by 4.50 inches.

The camshaft, forged steel, with integral cams, is carried on four bearings, the front and center ones being 2.25-inch die cast types, and the rear, Fig. 1, a double row ball-thrust type.

Lubrication is by a double plunger pump system, there being one plunger in the crankcase sump beneath the front cylinder casting, and another beneath the rear casting. Both pumps P, are driven by eccentrics on the camshaft. The oil they take from the reservoir through copper tubes to the main bearings and to all the gears. Each connecting-rod cap carries a small spoon which dips into an oil trough T, in the crankcase base, thereby maintaining sufficient splash to care for cylinder walls and the reciprocating parts.

Magneto Is on Pump Shaft

Water circulation is by a centrifugal brass pump, gear-driven from a side shaft on the left, the pump location being opposite the front cylinder casting. The magneto is located opposite the middle cylinder casting, and is driven through a continuation of the pump shaft. The fan, 16 inches in diameter, is a four-blade aluminum construction carried on two ball races.

The flywheel is 16.625 inches in diameter and has a face width of 4.875 inches and the large diameter of the cone portion is 15.75 inches with a 12.5 degree angle.

Fig. 2, showing an end section through the motor, gives an idea of the operation of the two plunger pumps, only one of which is shown in the illustration, on the camshaft.

Court Decisions and Opinions Regarding Owner's Responsibility in Accidents

THE responsibility of a car owner in case of accident should his son be driving the car, is one that comes up very frequently. Decisions in favor of or against the car owner in such cases can only be looked upon as precedents, and can be considered as possible verdicts in future cases.

In a recent example of this nature Franklin A. Errington and his wife were joint owners of a motor car, and one day while Errington was ill his wife took the machine out without his knowledge or consent and allowed their minor son to drive. During the trip Elizabeth Towers was injured. She brought suit for negligence against Errington, but the Court dismissed the case, holding that, "The question is, was the boy on the day of the accident engaged in the service or acting as the agent of the father." The decision apparently shows that it concluded the boy was not acting in such service.—Supreme Court, Trial Term, Richmond county, November, 1912. Towers vs. Errington.

Corporation Not To Blame

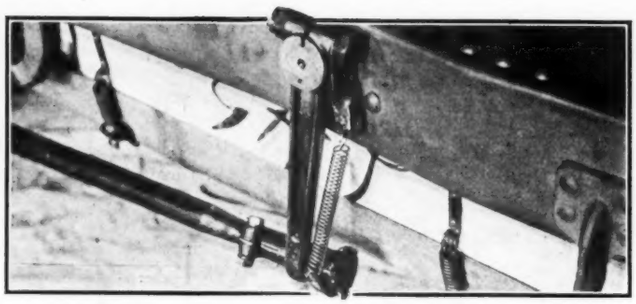
A somewhat similar case was that in which the Arnold Engineering Co., owned a motor car, which was used in the firm's business. One day the officers took the car to go on a pleasure trip, and injured one Power. The Court held that the negligence of the officers could not be imputed to the corporation, as they were not engaged in the company's business when on the trip.—Power vs. Arnold Engineering Co., 126 N. Y. Supp. 839.

Another case that is similarly decided is that in which the general manager of the company took one of the firm's cars on a business trip of his own. During the trip a pedestrian was injured, and he brought suit against the company. The Court dismissed the case, holding that the company was not liable for the conduct of the individual when he was on his own private business.—Clark vs. Buckmobile Co., 94 N. Y. Supp. 771.

Chauffeur Was Responsible

Still another case along the same line was that of a chauffeur who took his employer's car without permission and met with an accident. The owner of the car was not held responsible. Stewart vs. Baruch, 93 N. Y., Supp. 161.

The Court has further decided that where a father owns the car and is in the habit of allowing his son to drive it, the father is not liable for accidents caused by the son's negligence on days when the son takes the car out without the father's permission and when he is not on his father's business. In this particular case the Court held: "It is well settled that the master is not liable for injuries sustained by the negligence of his servant while engaged in an unauthorized act beyond the scope and duty of his employment for his own or another's purposes, although the servant is using the implements or property of the master in such unauthorized act."—Maher vs. Benedict, 108 N. Y. Supp. 228.



The Rostrum

Lamp Cost 60 Cents Per 1,000 Miles

EDITOR THE AUTOMOBILE—I have read with interest several articles in regard to gas and electric lighting which have appeared in THE AUTOMOBILE, and it might interest some of your readers to hear another man's practical experience in that line.

I have owned and operated cars continuously since I purchased one of the first steam Locomobiles in 1900. This was equipped with oil lamps for the road. I have used gas lamps with generators self-contained, with generators on the running-board, and was one of the first to equip with a Prest-O-Lite tank.

Last spring I purchased a 1913 medium-sized touring car equipped with electric starter and lights. I hesitated about getting the car on account of this very equipment, but at last decided to give it a trial.

It might be well to state here that the starter and generator are one unit, that all the wiring is run in flexible steel conduit, absolutely water and wearproof, and that the battery is of an excellent make, 100-120 ampere hours, 6-volt. The headlights are 24 candlepower, side-lights 4 candlepower, and dash and tail 2 candlepower. The generator produces 8 to 9 amperes at a car speed of 25 miles per hour, at a pressure of 14 volts (battery, two 50-60 ampere-hour units coupled in series for starter and generator in parallel for lighting).

I have driven my car just under 5,000 miles in a little less than 5 months with this result:

Headlights have been burned over 200 hours, other lights about 260 hours, starter has been used nearly 1,500 times. The battery has had about .2 gallon of distilled water added during this period, at a cost of 15 cents. One small bulb has been removed, but we will suppose the complete set needs new lamps for $3 (Mazda bulbs, 7 volts). Generator, etc., has used 1.5 pints of lubricating oil. Battery declared by expert from large power station to be good for at least 2 years yet. He is a conservative man. Light about twice as effective and satisfactory as gas.

With the above outfit I get more miles per gallon (12 to 15, compared with 10 to 12) than I did with a 1911 car of approximately the same piston displacement. It is true this is partially due to better engine design, but I also make up some of my consumption by having an electric starter, for I now stop my motor about three times as often, while waiting, as I used to, and it does the battery good rather than harm in using it to start up again.

I am sure I could go out on a testing run and prove technically that the electric outfit consumes quite a bit of power, but what I have found in practice is, that although this is undoubtedly so, we are getting greater mileage today with the electric set than we did a year or so ago without it, and, moreover, electricity is absolutely reliable under all conditions if it is properly designed and installed and given as much attention as the varnish on the outside of your machine.

I am one of the skeptics who has been converted to the new method of road illumination after 5 months' demonstration under all conditions.

New Rochelle, N. Y. GEO. C. CANNON.

Magneto and Batteries Connected in Series for Ford Lighting System

Editor THE AUTOMOBILE:—In looking through THE AUTOMOBILE for September 25, I find that E. C. Kornhoff wants a method of lighting his Ford headlights with either magneto or battery.

I think the diagram, Fig. 2, will answer his question thoroughly. It is understood that the magneto is grounded.

Nora, Neb. ELMER S. SMITH.

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This explanation given by Mr. Smith is in line with the explanations offered by other readers and which were published in the previous issue. By using the battery in series with the magneto in the method shown, the headlights will not only be available while the motor is running, but can also be used when car and motor are stationary.

Pulley Reduction for Sawing Wood With Automobile Motor and Wheels

Editor THE AUTOMOBILE:—1—When using an automobile as a power plant for sawing wood, what size should the pulley on the shaft that holds the saw be when the pulling wheel on the automobile is 32 inches, and what should one do with the other rear wheel that is not being used?

2—Should it be jacked up or left on the ground? Will it turn also, or will it stand idle and let the other wheel revolve?

Madison, Ga. A SUBSCRIBER.

—1—The amount of reduction between the wheel and the pulley depends on the nature of the sawing to be done by the motor. If heavy logs are to be sawed, the reduction will naturally have to be greater than would be necessary for light work. The flexibility given by the use of the different speeds of the car will, however, take care of the work under all ordinary con-

ditions. With a 32-inch wheel about an 8-inch pulley will give the proper reduction. On the average car this will bring the peripheral speed of the saw the same as that of the crankshaft of the motor when running on direct.

In order that you will not be racing your motor when the load is removed you should extend the control so that it is at your hand while sawing, unless there are two men on the job, in which case one can sit in the car and operate the motor just as if it were on the road.

2—It is most convenient and easiest on the car when a double drive is used. That is, both wheels should be jacked up from the ground and a belt run from each side. The tension in the belt should be equal in order that the work will be evenly distributed on both sides. If you were to jack up one wheel the drive would be transmitted through that wheel until the resistance to the revolving of that wheel became more than the power required to move the car. At that point the car would move and perhaps pull the saw along with it. The action of the differential is such that the drive is transmitted to the wheel offering the least resistance to revolve it. Also, if one wheel revolves while the other is stationary that wheel revolves at twice the speed that it would have were both wheels revolving at the same speed.

You will have the greatest difficulty in securing equal tension on both belts, and this should be done by having an adjustable platform for your circular saw so arranged that either side can be moved back independently of the other and thus the tension on either belt arranged to suit the drive. If the car is arranged in this way the work is not hard, nothing about the car is strained and the wear is negligible, amounting to no more than running easily over a good road.

Kerosene as a Cooling Agent

Editor THE AUTOMOBILE:—1—Will you kindly let me know if there are any reasons why one could not use kerosene in the cooling system of a car instead of the regulation non-freezing mixtures? I have used kerosene, but have been told that it is not advisable to do so.

2—Will the solution in a storage battery freeze? If so, what precautions should one take to keep it from freezing?

Spring Lake, Mich. GEORGE S. CHRISTMAN.

—1—Kerosene is not satisfactory as a cooling medium to be used in the waterjackets of a motor. It is bad for the hose connections, rotting them rapidly during the slightest warm weather. It will not carry away the heat of the motor fast enough and disastrous results may occur owing to its volatility and explosiveness when raised to its boiling temperature, which is dangerously low.

2—The solution in a storage battery will not freeze unless the temperature falls below the zero mark. It is not until that point that the danger arises and the only precaution at that time that can be taken is to either heat the garage in which the car is kept or to take the battery ont of the car and bring it into the house. There is no danger of the battery solution freezing while the battery is in use as sufficient heat is generated to keep it warm.

The effect of the temperature on the battery capacity is marked and a curve given in Storage Battery Engineering by Lyndon reproduced in Fig. 1 gives surprising facts regarding the falling off of the battery efficiency in cold weather. The noticeable point in these curves is that the variation in efficiency is greater at more rapid discharge rates. From this it would appear that much less can be expected from a storage battery in use with a cranking motor in cold weather than when it is warm. That is, when the full strength of the battery is needed most, the battery is really at its lowest efficiency. The difference, however, is not apt to be marked except with an engine that is extremely hard to start or when the battery is in a nearly discharged state.

Except during the coldest parts of the year the temperature will not be low enough to bother you.

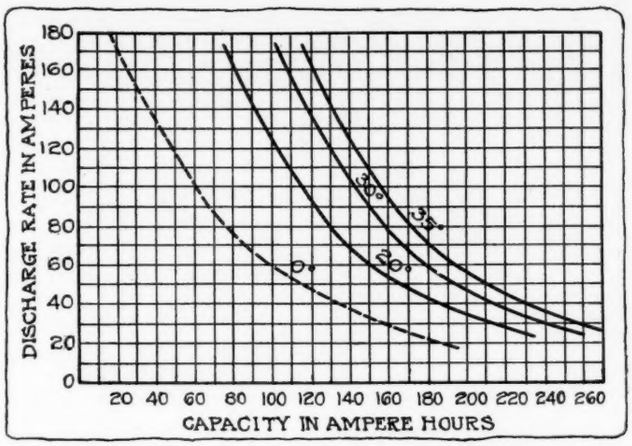


Fig. 1—Efficiencies at different temperatures and discharge rates

Using the Oxygen Carbon Remover

Editor THE AUTOMOBILE:—1—In removing carbon from the combustion chamber with an oxygen compressor, does the burner have to be held close to the carbon to remove it? Is there any carbon sediment left?

2—Show by diagram the correct positions of the contact breaker and distributer, when they are in correct time in the following magnetos, Splitdorf, Remy, Bosch, and Bosch low-tension.

Nora, Nebr. E. S. S.

1—The nozzle on an oxygen remover is generally held about 1 inch from the carbon at the point at which the operator is working. The gas should issue from the nozzle at a pressure of 15 pounds to the square inch by gauge, and when at this distance from the carbon will keep it burning and at the same time will afford sufficient pressure to displace the air from the combustion chamber. When the work is properly done every vestige of carbon should be consumed and there should not be the slightest trace of sediment or residue.

Bosch Breaker Box Simple

2—The correct positions of the breaker box mechanism and distributer at the firing point of the magnetos you mention are given in the accompanying illustrations. Fig. 5 shows that of the

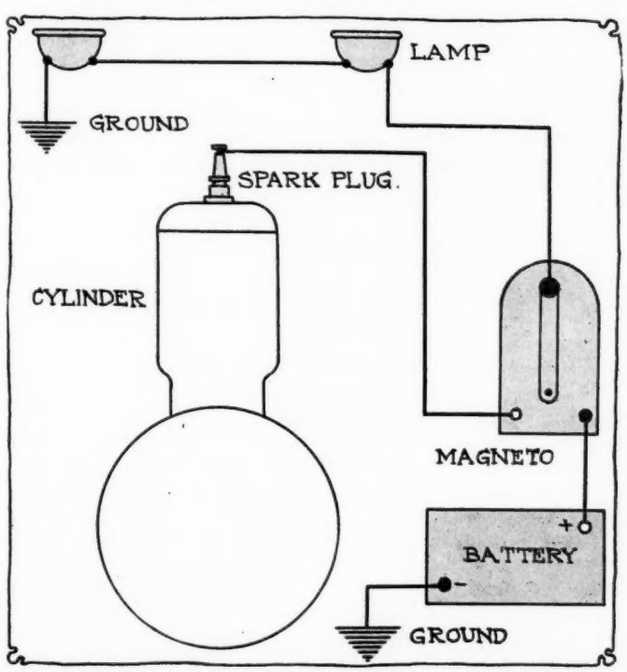


Fig. 2—Method for wiring Ford lights to include the battery

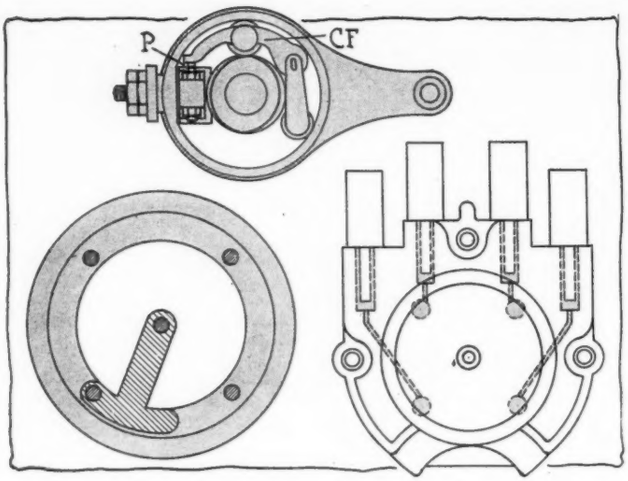


Fig. 3—Mechanism of Splitdorf breaker box and distributer

Bosch magneto. The interrupter or circuit breaker is fitted into the end of the armature shaft which is taper-bored and fitted with a keyway. The interrupter is held in position by a fastening screw which holds it to the tapered shaft. By removing the screw and the key the interrupter can be removed from the shaft.

Twice during each revolution of the armature the primary circuit is made and broken. This operation is effected by the interrupter lever carrying the part C F coming in contact with the steel segments shown. These segments are supported on the interrupter housing. When the magneto interrupter lever is not being acted upon by the steel segment the platinum points P are in contact. This closes the primary circuit. Then as the armature rotates further and the interrupter again comes in contact with the segment, the platinum points open and interrupt the primary circuit. At the opening of the contact the ignition spark occurs instantaneously. The exact point of opening of the contact between the two platinum points is the exact time that the piston should be set in the cylinder which is in a position to fire provided that the distributer is in the correct position. The distributer rotor is geared in such ratio to the armature shaft that it runs at camshaft speed for a four-cycle motor. The rotor passes over four segments making contact with them, for a four-cylinder motor and each of these represents the high-tension line to one of the spark plugs. The wiring from the segments in the distributer must be such that it is carried to the spark plugs in the proper firing order. It must be remembered in connecting the distributer segments to the spark plugs that the distributer rotates in the opposite direction to the magneto.

Fig. 3 gives the position of the Splitdorf breaker box and distributer mechanism when in the correct firing position. The principal is the same as in the Bosch except that the mechanism for separating the platinum points is different. The method of properly timing the magneto is to retard the spark advance mechanism on the steering column to its limit and connect it to the spark advance lever on the breaker box of the magneto so that if the magneto shaft revolves in a clockwise direction, looking at the driving end, the breaker box lever would be at its topmost position. If the shaft revolves in a counter-clockwise direction the lever should be at the bottom limit and advance upward. The armature shafts should now be slowly revolved in the direction of rotation until the over breaker cam comes in contact with the roller in the breaker bar and just begins to separate the platinum points. This is a point at which firing takes place and the piston should be in its firing position in the proper cylinder at this time. The bronze sector of the distributer is shown in connection with the distributer mechanism in the same illustration. When the cylinder No. 1 in in correct firing position and No. 1 sector on the distributer is making contact.

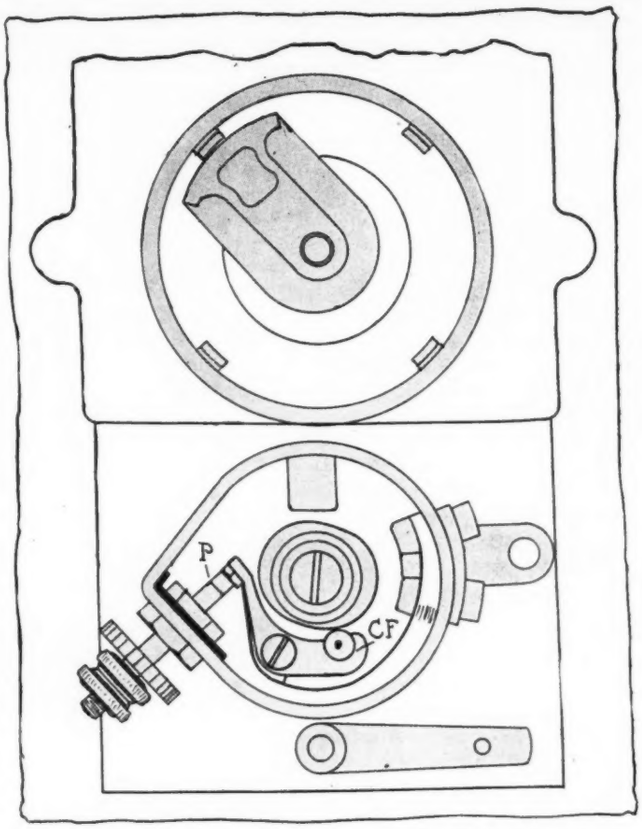


Fig. 4—Remy points about to be separated—distributer position

the wire from that sector should be connected to the spark plug and cylinder No. 1. Four-cylinder motors generally fire in 1—3—4—2 order but sometimes the 1—2—4—3 order is used.

Remy Mechanism Explained

Fig. 4 shows the Remy breaker box and distributer and the same general statements apply to its operation. In all it is a matter of having the platinum point just about to separate or just separating when the desired cylinder is at the firing point and the distributer rotor is making contact with the correct segment for that cylinder. In all cases in setting the magneto the spark should be retarded to the utmost and the cylinder made to fire on dead center with the spark at maximum retard. The Bosch magnetic plug system with low-tension type of magneto has the same principle and style of operation as the Bosch high-tension type. The system is illustrated in Fig. 4.

Interested in Cyclecars

Editor THE AUTOMOBILE:—1—Is there any agency in the United States where the Baby Peugeot can be bought?

2—Will you give me the address of several of the manufacturers that will put out cyclecars in the spring?

3—Will any of them have sliding gear transmission and unit power plant?

Woodbine, Iowa. L. L. SNYDER.

—1—The Baby Peugeot can be bought in this country at the Peugeot agency at 1620 Broadway, New York City, where one of the cars is on the floor of the showroom. The price of the car is $975 and the horsepower rating is 12.

2—A list of some of the prominent cyclecar manufacturers in this country follows:

American Cyclecar Co., Detroit, Mich.; Imp Cyclecar Co., Auburn, Ind.; Twombly Motors Co., New York City; Los Angeles Cyclecar Co., Los Angeles, Cal.; Cyclecar Company, Champaign, Ill.; Economy Car Co., Indianapolis, Ind.; Downing Detroit Motor Co., Detroit, Mich.; Palmer Motor Car Co., Detroit, Mich.; Princess Cyclecar Co., Detroit, Mich.; Falcon Cyclecar Co., Cleveland, Ohio; Traveler Motor Car Co., Detroit,

Mich.; Davis Cyclecar Co., Detroit, Mich.; Saxon Motor Car Co., Detroit, Mich.; Flagler Cyclecar Co., 2829 N. Halsted St., Chicago, Ill.; Joliet Auto Truck Co., Joliet, Ill.; W. S. Frazier & Co., Aurora, Ill.; Detroit Cyclecar Co., Detroit, Mich.; Victor Motor Car Co., Philadelphia, Pa.; American Voiturette Co., Detroit, Mich.; DeCross Cyclecar Co., Cincinnati, Ohio; Woods Mobilette Co., Chicago, Ill.; C. V. Stahl, Philadelphia, Pa.; Partin Mfg. Co., Chicago, Ill.; Carlson-Wainstrom Mfg. Co., Philadelphia, Pa.; California Cyclecar Co., Los Angeles, Cal.; J. S. Booth, Detroit, Mich.; Auto-Ette Company, Chrisman, Ill.; Fenton Engineering Co., Fenton, Mich. (Signet), and Gadabout Motor Corp., 29 Broadway, N. Y.

3—Many of these cars have sliding gear transmission and unit power plant but it is to be doubted if these can be called true cyclecars. They are more in the miniature or small car class.

Oxygen as a Decarbonizing Agent

Editor THE AUTOMOBILE:—Would you kindly give me directions for using oxygen in burning carbon out of cylinders?

In THE AUTOMOBILE for September 18, you spoke very highly of its use and as I do most of my repair work myself, I am interested in anything that will do away with taking the motor down to clean it.

Stockbridge, Mich. J. McC.

—All that is necessary in using oxygen to remove carbon from the cylinders is an oxygen bell, a reducing valve and gauge and a long, slender, pliable brass nozzle. The rest of the tools are simply a wrench for removing spark-plugs, etc., and a wax taper for bringing the carbon to a glow.

Removing the spark-plug or using any other convenient opening into the cylinder, the oxygen is admitted by means of the nozzle to force out the impure gases in the combustion space and to fill it with pure oxygen. The wax taper is then inserted in the opening and the carbon near the opening is brought to a glow.

The oxygen jet is now brought to within an inch of the point at which the carbon is to be cleaned out and held there while the carbon burns away. This process is continued all over the cylinder wherever any carbon can be found until it is all burned out. Little sparks will issue from the opening through which the nozzle is inserted as the burning carbon is blown out by the 15-pound pressure coming from the end of the oxygen nozzle.

It is of the greatest importance that the valves be tightly closed in the cylinder in which you are working. Therefore, before the jet is inserted, the motor is turned over until the piston in that cylinder is on upper dead center on the firing stroke. Both valves will be closed and the only opening into the cylinder will be that in which the jet is worked.

The copper nozzle will not do because it is too soft. A few other points to remember in doing the work are the following:

After cleaning out cylinders, open the pressure gauge till it registers about 30 pounds and blow out any residue with the oxygen.

On an oily motor be careful when first putting the taper into the cylinder as a slight explosion is apt to result.

Work through as small a hole as possible. It saves oxygen and makes the work quicker.

Use taper to find the carbon deposits in obscure parts of the cylinder head.

An oxygen bell will last long enough to clean about thirty-two cylinders. An expert at the job can clean an entire motor in 40 minutes.

Wants Open Streamline Body

Editor THE AUTOMOBILE:—I was very much interested in the letter of Mr. Julian F. Brasor in THE AUTOMOBILE for September 15, "Criticises American Automobile Bodies."

Could you tell me if I could get such a body designed to fit a 1913 Franklin H chassis on which I now have a limousine body but for which I want an open one for next spring?

Saranac Lake, N. Y. A. J. MAJOR.

—Such a body as that mentioned by Mr. Brasor could be built by any good body maker and could be so designed that it will fit your Franklin H chassis. The larger body makers are well in touch with the various models produced by different automobile companies and to these you would not have to furnish the chassis dimensions, as they would probably have them.

To smaller builders it would be necessary for you to furnish the dimensions so that they could design the body to meet the necessity of the Franklin chassis. As this chassis is somewhat high, the body would have to have a low hung effect to secure the racy appearance of this type. This effect is secured by long, unbroken horizontal lines and it would be a part of the designer's work to slightly modify the design, if necessary, to get this result on the Franklin chassis.

Regarding alterations to the chassis itself, you would probably have to have the steering column angle changed to meet the requirements of the new body. As it is now, the column is probably too nearly upright for the streamline touring body you desire.

Another feature which would cause a pronounced change in the lines of the body is the fact that the Franklin car has no radiator. The lines of the car could be worked back though in such a way that a pleasing effect would be given by the connection of the sloping line of the hood with the cowl.

Wherever you have the body made it would be necessary for you to bring the chassis to the shop in order to get satisfactory work.

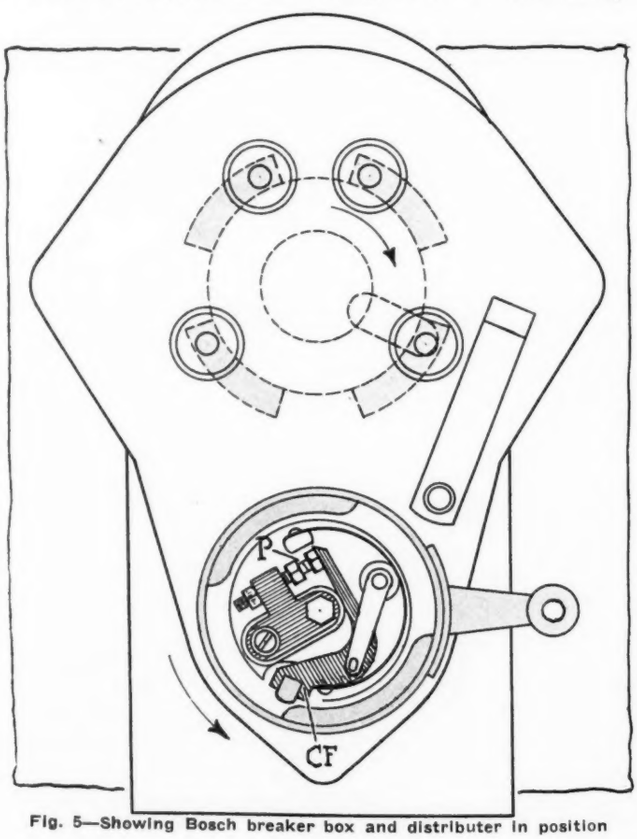


Fig. 5—Showing Bosch breaker box and distributer in position

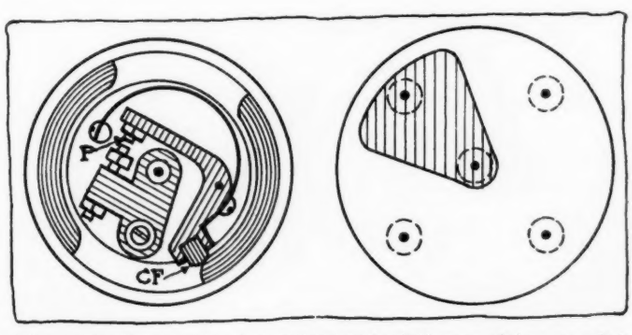


Fig. 6—Bosch magneto plug system with platinum points separated

Horses' Shoes Cut Roads Like Chisels

Colonel Stevens, State Highway Commissioner for New Jersey, Talks To Road Congress on Highway Wear

Gives Warning of the Use of So-Called Cold Oils—States That Non-Asphaltic Oils Seem to Foster Holes

COLONEL Edmund A. Stevens, state highway commissioner for New Jersey, gave some interesting figures on the relative wear of horse and motor traffic on highways at the 6-day convention of the Third American Road Congress at Detroit, Mich., in which over 7,000 delegates participated. The ethics of road building were discussed, bringing out all the varied aspects of road construction.

A draft horse weighing 1,200 lbs. will have all his weight at one time on 2 feet. He will exert say 1 horsepower at a speed of 4 miles. The vertical force at the foot is 600 lbs., the horizontal $23{,}000 \div 2 \times 4 \times 88 = 47$ lbs. These forces are or may well be concentrated on a toe calk 2 inches in width; the resultant force slightly exceeding 300 lbs. per linear inch.

A motor truck weighing, loaded, 16,000 lbs. and exerting at the wheel rims say 30 H. P. at 10 miles an hour, will with 60% of load on rear axle, exert a vertical force of 4,800 lbs. and a horizontal of 562.5 lbs. at each rear rim, the resultant being about 800 lbs. per lineal inch for six inch tire.

For a pleasure car weighing 4,000 lbs. with 60 per cent. of weight on rear axle and exerting 40 H. P. at the wheel rims with a speed of 35 miles, the vertical force at each wheel is 1,200 and the horizontal 214. The resultant is about 400 per linear inch for a bearing width of 3 inches.

At curves with high speed cars, the horizontal force is considerably increased, for it is impossible to so "bank" a curve as to suit the speed of all classes of traffic.

In the case of wheels transmitting vertical loads only, observation indicates but little dust raising from a road not overlaid with loose dust. Such a wheel will at the point of mathematical tangency have no velocity relative to the road; a vertical velocity is imparted to it and as any section leaves the surface it will raise with it any of the lighter particles that are loose and may come into contact with it. At the driving wheel there is a slight slip which in addition to lifting will throw particles backwards.

These are the forces tearing at the road surface. In some cases they are more than the road can stand. The horse's calk acts somewhat like a chisel. It will pry out the binding material between the stones as well as the latter themselves when the bond is weakened. The driving wheels of motor vehicles push or suck any material thus loosened out of place. The binder loses weight as it parts with moisture; besides this, without moisture it also loses, not only its property of recementing itself under pressure, but, to a great extent, its binding power as well The real work of transmitting the stresses due to traffic must be borne by the stone. These are merely held in place by the binder. The latter is gouged out by the horse, drawn or pushed out by the automobile tire, blown away by the wind, or washed off by the rain and a loosening of the upper stone results.

Colonel followed with a technical dissertation on road maintenance and closed by stating:

"In closing, a word of warning as to the use of the so called cold oils may not be out of place. Those of the so called non-asphaltic class, to a greater extent than the so called light asphaltic oils, seem to act as lubricant on road materials and to foster pot holes, ravelling and other failures. It may be possible to properly apply these materials, but, if so, it is rarely done. It is certain that even slight depressions will cause a deep penetration of the road. The dust laying qualities of the material thus absorbed are lost and its lubricating effect given the best possible conditions to get in its pernicious work. Local authorities and even private individuals seem to select roads with uneven surfaces as those on which to use these oils."

"We Waste 25 Per Cent. of the Money Spent on Earth Roads"

S. E. Bradt, Member Illinois State Highway Department at American Road Congress

WHILE railroad rates have been reduced from 7 1-3 cents per ton-mile in 1837 to 7.8 mills per ton-mile in 1905, a reduction of nearly 90 per cent., practically no reduction has been made in the cost of ton-mile transportation on our highways.

The census figures offer some valuable material showing the need for highway improvement. These figures show that in 1890 36 per cent. of the people of this country lived in cities. In 1900, 40 per cent., and in 1910, 46 per cent., an increase of 10 per cent. in city population as compared with rural population in 20 years; thus by this movement our food producing population is being depleted to an alarming extent.

The extent to which the farmer is using the automobile was well demonstrated at an annual meeting of an agricultural society in Illinois held 3 miles from De Kalb. The attendance was 1,100, of which 90 per cent. were farmers actually living on farms or working them. By actual count there were on the grounds twenty-six horse-drawn vehicles, compared with 109 automobiles. Not over seventy-five people in this gathering came in horse buggies, over 600 came in motor cars, and the remainder by trolley.

The greatest factor in the urgent demand for good roads is the automobile, and the enormous increase in its use can best be illustrated by a traffic census recently taken at a point west of De Kalb, Ill., on the Trans-continental Highway. This census was taken during the first 6 months of 1907, during August and September, 1912, and again during August and September, 1913. In 1907 the motor traffic was 5 per cent. of the total traffic; in 1912, 5 years later, motor traffic was 50 per cent. of the total traffic, and in 1913 it was 60 per cent. of the total.

We have in the United States approximately 2,200,000 miles of country highways; 15 to 20 per cent. of our main highways carries from 80 to 90 per cent. of the total traffic; 15 to 20 per cent. of our highways carries approximately 60 per cent. of all farm traffic. This mileage of 20 per cent. will be sufficient to cross most of the states both north and south and east and west every 6 miles, and will include all of the main market roads, inter-county, interstate, and transcontinental highways. Fifteen to 20 per cent. of this 2,200,000 miles would be approximately 400,000 miles. It is estimated that 11 per cent. of our roads are already improved. This, however, includes all classes of improved roads, such as gravel, the various types of macadams, brick and concrete. It is probable that less than 5 per cent. (not exceeding 100,000 miles) are so improved that they will give a wear of over 10 years, even the well maintained. We therefore believe that the mileage yet to be improved is not less than 300,000 miles.

Let us divide this 300,000 miles into two classes, viz., the roads connecting all state capitals and larger cities, comprising approximately 50,000 miles; and the main market roads connecting the county seats, cities and villages of the different states, comprising approximately 250,000 miles. The first 50,000 miles above referred to, being the main traveled roads, should be 18 to 20 feet in width. The roads connecting the smaller centers of population, such as county seats, could vary in width from 12 to 16 feet, depending upon the probable traffic.

To accommodate the traffic the 50,000 miles, 18 to 20 feet wide, constructed as above indicated, would cost not less than $15,000 per mile, or a total of $750,000,000 for the entire mileage. The 250,000 miles, averaging from 12 to 16 feet, would cost approximately $10,000 per mile, or $2,500,000,000; thus making the total cost of the entire 300,000 miles $3,250,000,000.

If we grant the premises in the foregoing discussion to be true, then the conclusion is also true that we are warranted in asking that the Government shall over a period of 15 or 20 years assist in this road movement, at least to the extent of the cost of the 50,000 miles of interstate highways which we have estimated at $750,000,000. Congress has authorized the issuing of bonds for the building of the Panama Canal for $350,000,000, a project of approximately half the cost of this system of highways; and should the revenues of the government require it, bonds should likewise be issued for the construction of our highways. If the government undertakes to furnish this $750,000,000, as above, there would still remain the sum of $2,500,000,000 to be contributed and expended by the states and counties, in proportion to the total mileage of each state. This amount of money spread over a period of 15 years would mean an annual cost of $166,000,000 to the states and counties of the nation. This is indeed a large annual expenditure, but let us analyze the situation.

Let me again call your attention to estimated annual traffic loss of $250,000,000. When we shall have improved the roads that carry 80 to 90 per cent. of this traffic, then we shall be saving from 200 to 225 millions annually, hence from this standpoint the improvement will soon pay for itself. Again, we are now expending annually on our roads and bridges in the United States a sum estimated at $180,000,000, $150,000,000 of which is being raised by general taxation and $30,000,000 by bond issues. This, as you will notice, is largely in excess of the annual expenditure called for in this proposed system of roads. Of this sum $180,000,000, $100,000,000 is now being expended in building and repairing bridges and culverts and caring for the earth roads and $80,000,000 in the more permanent types of road construction. These earth roads are bound to constitute by far the larger part of our roads to come, and we must continue not only to care for them as we have done in the past, but to increase their efficiency by more thorough and scientific methods of maintenance.

It is generally conceded that at least 25 or 30 per cent. of money now expended on our earth roads is being used in a haphazard way that brings no permanent benefit, which would mean that $75,000,000 economically administered would give us a much better system of earth roads than we have today and leave $25,000,000 for other purposes. If this $25,000,000 could be added to the $80,000,000 now being expended on hard roads, we would have a sum of $105,000,000 for that purpose, and thus leave only about $60,000,000 still to be provided for. Without question the taxes for the maintenance of state governments, municipalities, schools and roads are already a sufficient immediate burden upon the people. I therefore feel justified in taking the position that this project is too large to be paid for through the regular channels of the state and county taxes; and that at least the $60,000,000 above referred to, in addition to the $30,000,000 now being raised by a bond issue, should be provided for by the same method.

Ohio Motorists Are Fighting Higher Fees

State Automobile Association Seeks To Enjoin The Secretary of State from Enforcing Warnes Law

Hopes To Have Measure Declared Unconstitutional —Will Go To Supreme Court If Necessary

COLUMBUS, O., Oct. 14—The arguments in the case filed by the attorneys of the Ohio State Automobile Assn., to enjoin Secretary of State Graves from collecting the larger fees for registering motor cars in Ohio, as provided by the Warnes law, will be made in the Franklin county courts October 18. The case was originally set for October 9, but went over to the later date because of the absence of Attorney General Hogan.

The suit was filed recently by C. D. Saviers, of Columbus, Richard H. Lee, of Cleveland, and Harry L. Gordon, of Cincinnati, attorneys for the Ohio Automobile Assn. A number of different things are set forth in the petition, principal among which are double taxation, unreasonableness and the difficulty of judging horse power of motor vehicles properly.

The officers and attorneys of the Ohio State Automobile Assn. have great hopes of having the Warnes law declared unconstitutional and will take the case to the Supreme Court of Ohio if necessary.

November 5 and 6 Texas Road Days

HOUSTON, TEX., Oct. 12—Governor Colquitt has issued a proclamation naming November 5 and 6 as Good Roads days in Texas. He promises to either work the roads during those days himself or to pay $25 into a good roads fund.

October 24-25 Kentucky Road Days

FRANKFORT, KY., Oct. 12—Complying with the request of the State Good Roads Association, Governor McCreary of Kentucky has designated Friday and Saturday, October 24 and 26, as good roads days for this State. The citizens have been called upon to get out and work the roads of their counties between the hours of 8 a. m. and 5 p. m. The proclamation refers to dirt roads, turnpike and gravel roads.

Georgia Taxes Cars To Build Roads

SAVANNAH, GA., Oct. 12—Phil Cook, Secretary of State, estimates that the automobile tax law enacted at the last session of the general assembly will yield the state a net revenue of approximately a hundred thousand dollars. The provisions of the law in a nutshell are as follows:

Every automobile, old and new, must be registered with the state and renumbered immediately and annually thereafter.

City authorities are empowered to require that the state numbers of all automobiles shall be registered with municipal clerks, but cannot charge for such registration.

Each automobile owner shall register each car once a year before March 1, and shall pay an annual tax of five dollars, instead of two dollars, as at present.

The new numbers will refer to the calendar year for which they are issued.

Visiting automobiles must be registered in the cities where registration is required under the municipal law.

The number of automobiles registered so far by the Secretary of State approximates twenty-two thousand. It is estimated that there are now two thousand commercial motor vehicles in use in Georgia, and these are also taxable under the state law.

The money thus derived by the state will be distributed to the counties in the state solely for road building purposes, the act requiring that it be devoted to roads. The distribution will be in accordance with rural free delivery mileage in each county, based on United States government reports.

Cole starting system school at the factory

Road Congress at Philadelphia

PHILADELPHIA, PA., Oct. 14—The Fourth American Good Roads Congress will be held at the First Regiment Armory in this city on December 9, 10, 11 and 12, in connection with the Tenth Annual Convention of the American Road Builders' Assn. Highway engineers and contractors from all parts of the country will be present at the meeting.

TOPEKA, KAN., Oct. 12—The second annual convention of the Kansas State Automobile Assn., held at Hutchinson, Kan., last week was attended by a large crowd of enthusiastic motorists. The officers of the association were re-elected as follows: President, Charles W. Barnes, of Topeka; secretary-treasurer, D. E. Watkins, of Topeka; vice-president at large, L. L. Uhls, of Johnson county and George S. Standfield, of Topeka. Plans for better roads occupied much of the attention of the convention, and formed the keynote of the discussions.

Electrical Engineers in Philadelphia

PHILADELPHIA, PA., Oct. 13—The 287th meeting of the American Institute of Electrical Engineers opened this afternoon at the Drexel Institute under the auspices of the Philadelphia Chapter. Charles Fair, of Schenectady, N. Y., read a paper on "Electric Drive in Machine Shops," and there were papers on "Industrial Sub-stations," by H. P. Liversidge of Philadelphia, and "Relation of Plant Size to Power Cost," by Paul M. Lincoln, of Pittsburgh.

PHILADELPHIA, PA., Oct. 12—The annual sessions of the National Fire Prevention Convention were opened in this city this morning in the Mayor's reception room of the City Hall. The feature of the first day was a spectacular demonstration of this city's fire-fighting methods and apparatus, including the motor-driven vehicles. When the sessions are resumed Monday morning it is expected that at least 300 delegates will be on hand.

To Sell Hartford Foundry

HARTFORD, CONN., Oct. 14—Edward C. Frisbie, receiver of the Hartford Foundry Co., has been instructed by the superior court to offer at public sale on October 27 the real estate and other property of the corporation located on Windsor street. The real estate located in a growing factory district has been appraised at $40,000 and the foundry and equipment at $8,000. The Charter Oak National Bank has a judgment of foreclosure to the amount of $20,000 against the real estate, the last day of redemption being Tuesday, November 4th. The foundry had an equity of from $15,000 to $20,000 in the property.

MILWAUKEE, WIS., Oct. 11—The Milwaukee Oil Pump & Tank Co., Milwaukee, has filed a voluntary petition in bankruptcy, scheduling assets at $7,717.31 and liabilities $8,026.23. The company manufacturers oil and gasoline tanks with automatic pumps for public and private garages and has a factory at 259 Clinton street. Arthur E. Riess is president.

Cole Conducts Starter School

INDIANAPOLIS, IND., Oct. 12—The Cole Motor Car Co., of this city, recently conducted a school in self-starting, in charge of H. E. Phillips, head of the educational department of the Dayton Engineering Laboratories Co., which makes the Delco system. The students included Cole dealers and mechanics from all over the central West. They attended three classes a day.

The Engineering Digest

Data From German Aviation Motor Contest of Interest to Builders of Modern Automobile Motors

Disposal of Heat Absorbed by the Piston Head One of the Main Factors To Make or Mar the Light Engine

AS German aviation motors are made by automobile manufacturers and do not differ much in principle or general design from the motors used for automobile racing cars, many of the observations made by the judges of the contest for aviation motors which was held in Germany last spring present points of direct interest to automobile engineers and builders These observations are now accessible, the last instalment being published in *Zeitschrift des Vereines Deutscher Ingenieure* of Sep. 6 as well as in *Zeitschrift für Flugtechnik und Motorluftschiffahrt* of Sep. 13. The earlier instalments are largely descriptive of the 16 motors which were tried out and of several others, mainly rotary motors of the Gnôme type but of German manufacture, which either did not measure up to the requirements or were withdrawn before the close of the contest. The authors of the report are the well-known specialist on motors and aviation engineering, Professor, Doctor-Engineer F. Bendemann, and Diploma-Engineer Seppeler who was identified with the bench tests of the motors in the contest. It is therefore based on the fullest possible fund of information.

The special interest attaching to the upside-down Daimler motors which took part in the contest and are mentioned in this report was singled out for explanation and comment last week in view of the problem which they exemplify; namely that of building motors with stationary cylinders capable of operating in any position, independently of the influences of gravitation, on a parity in this respect with the motors of the Gnôme type with revolving cylinders.

In the following, observations from the report relating to progress evinced at the contest and the lessons drawn from its results are presented substantially in the words of the authors, and the remarks of direct or suggestive interest to all builders of motors—not only aviation motors—are emphasized by specially heavy type.

Water-cooled Motors of Automobile Parentage the Only Ones Really Tested

Cooling by water or by air? Stationary or revolving cylinders? These two questions seem almost identical now, at least in so far as the results of the contest would indicate. For, while a rotary motor with water cooling was entered, it did not come to trial, and at all events the water did not pass through a radiator. Air-cooling with stationary cylinders, on the other hand, was also not represented at the contest, although this system plays a rather important part in France, the 8-cylinder Renault V-motor with a blower system for cooling being most prominently used there, next to the rotary Gnôme motor.

The rotary motors with air-cooling were weakly represented at the contest and could not therefore give a true idea of the efficiency of their type as compared with the upright motors with water-cooling. It is in fact very difficult to establish a comparison between these two types, because power and weight are not alone the deciding factors. The great simplicity of the mounting of the rotary motor must be considered, involving, as it does, the elimination of many parts and connections which are possible sources of trouble; further, the possibility of building machines with motors of this type which have a great carrying capacity for short flights, but above all the flywheel effect of the revolving cylinders, **the value of which lies less in the greater uniformity of the running than in the ability of the machine to overcome sudden gusts of wind more forcibly.** The rotary motor pulls better under such circumstances. It can temporarily supply a strongly increased power output from its rotating masses, while the speed of other motors drops rapidly under the same conditions. Yet it is not practicable to do justice to these properties in figures, and the discretion left with the judges of the contest for taking advantages of this nature in consideration could not be exercised because the rotary motors which were presented failed to toe the mark of their type. It is also to be noted that even the Gnôme motor would not have come among the first in value of performance under the 7-hour test regulations, by which merit was judged according to the total weight of the motor plus the weight of the fuel and oil used for it. To make it come to a par with the best German motors it would have been necessary to reduce the running time to 2 hours. And yet it is with this motor that by far the longest flights have been made; up to 13 hours. The sharp contradiction involved in this fact has to be explained on untechnical grounds, in part, and a final decision with regard to the intrinsic superiority of one type or the other will have to be postponed until a new contest may be held.

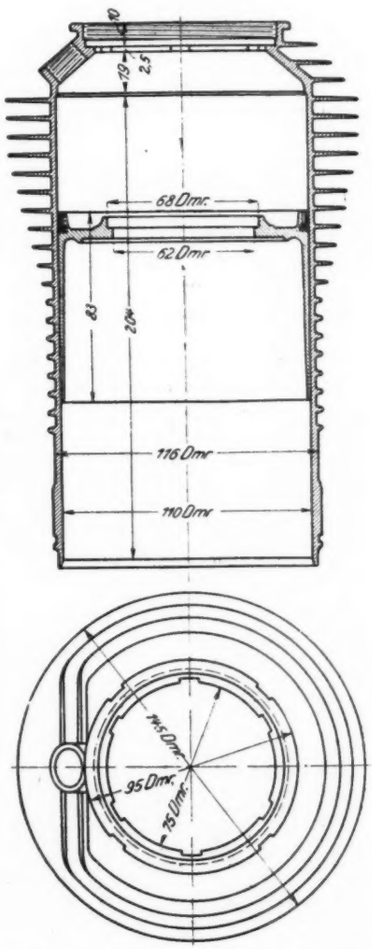


Fig. 1—Piston design for 50-horsepower Gnôme rotary motor

Difficulties in Constructing Rotary Motors

The building of a first-class rotary motor

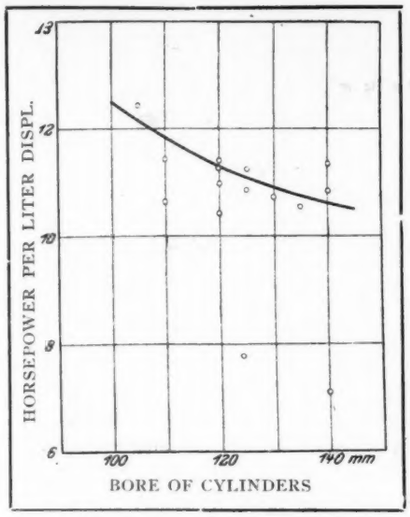


Fig. 2—Larger bore gives smaller efficiency unit

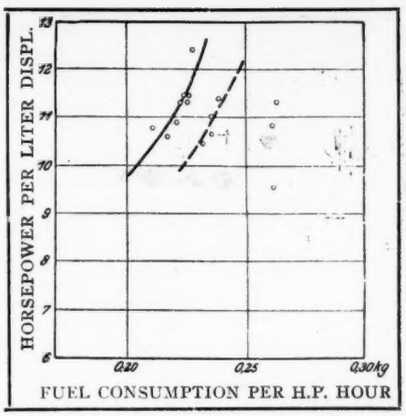


Fig. 3—Consumption grows as efficiency unit rises

demands extensive and costly tests with a view to the special conditions under which such motors are operated and is rendered still more difficult by the existing patent rights on certain features of construction. The concentric arrangement of inlet and exhaust valves in the piston and the special form of packing for the piston which so far has been proved most suitable for rotary motors are the property of the French factory. **The means for securing a tight joint between the piston and the cylinder wall consists in a thin slit brass ring of L-section,** as shown in Fig. 1, representing cylinder and piston in a 50-horsepower Gnôme motor, and this is much more flexible than an ordinary piston ring which is liable to stick and seize at high heats. The right piston design is on the whole difficult in the case of rotary motors. The weight must be exceedingly small; for the tangential accelerations and retardations which arise during the rotation [complete diagrams of which would here be interesting, but they have not been presented as yet, so far as noticed, anywhere in the technical press.—Ed.] cause very high lateral pressures against the cylinder wall, and these are increased rapidly with increasing piston weight. Furthermore, the friction corresponding to these pressures produces a heat which interferes seriously with the task of conducting the heat away from the material of the piston. For this reason it is necessary to hold the efficiency unit—being the power output per liter of piston displacement—far below that which is obtainable with water-cooled upright motors, the proportions being a maximum of 6½ horsepowers for the rotary type as against 11 to 12 horsepowers for the upright. The size of the cylinders with the rotary type is by the same factors cut down to narrow limits. In the 70-horsepower Gnôme motor with 130-millimeter bores, the cooling of the pistons has, for example, already been proved insufficient. And in the later design of an 80-horsepower motor the bore has therefore been reduced to 124 millimeters, while the stroke has been made 140. Similar experiences with German rotary motors have not yet been established. The only motor of comparable size which had been entered for the contest was unfortunately withdrawn before the trial.

The Water-Cooled Motors With Stationary Cylinders

The obtainable efficiency unit, expressed in horsepowers per liter of piston displacement [more expressively termed "stroke volume" in German] depends mainly upon the removal of heat from those parts which are swept by the fuel gases but do not come in contact with the cooling mediums; water, air or fresh charges. These parts are in the aviation motors of the present day the pistons and exhaust valves. The heat absorbed by the piston head must mostly be conducted through the material of the piston itself to the trunk surface and must from here find its way to the cylinder wall. Only a small portion can be carried away by the fresh charges or in the lubricating oil. The larger the diameter of the piston the more difficult becomes the disposal of the heat by way of the cylinder wall. The efficiency unit drops therefore with increasing bore in the manner shown for 16 of the motors in the appended table and the diagram, Fig. 2, representing this feature. The bore can thus not be increased beyond certain limits if the maximum efficiency unit shall be attained. And, as the stroke cannot be made much larger than the bore, with a view to steady running [without a flywheel more effective as such than the airscrew which took its place in the aviation motors in this contest.—Ed.] the size of cylinders is practically determined by the factor of piston-cooling. **Various attempts at realizing specially favorable weight and consumption figures in the contest by means of over-large cylinder dimensions came to naught through the influence of this factor.**

What Happens When Pistons Are Overheated

When the heat cannot be removed from the piston head by reason of a too-high efficiency unit, too-large a bore, insufficient lubrication or cooling of the bearing surfaces, the middle of the piston head becomes red-hot and, according to circumstances, the overheated portion extends more or less closely to the trunk portion. The premature ignitions which now occur interfere more and more with operation. **The lubrication of the piston pin and of the bearing surface becomes ineffective, the piston rings allow gas to pass, begin to stick and roughen the bearing surfaces. At the same time radial cracks are usually formed in the piston head and these cracks are soon enlarged by the gases which strike through them. Finally the piston expands and seizes.**

Best Means for Scattering Heat Centers

The admissible efficiency units also depend upon the efficacy of the cylinder-cooling system, upon the circulation of the cooling medium and upon the thickness of the cylinder walls. The new Daimler motor with steel cylinders repre-

TEST DATA FOR 16 AVIATION MOTORS OF AUTOMOBILE RACING MOTOR TYPE

Make of Motor	Argus	N.A.G.	Argus	Argus	Daimler	Dasse and Selve	Deutschland	Daimler	Daimler	Daimler	Daimler	N.A.G.	Daimler	Schrōter	Daimler	Benz
No. of cylinders	4	4	4	6	4	4	4	4	4	4	6	4	4	6	6	4
Bore, mm	140	120	125	125	140	110	140	120	120	120	120	135	110	124	105	130
Stroke, mm	140	120	130	130	150	125	160	140	140	140	140	160	140	160	140	102
Bore: stroke ratio	1.000	1.000	0.961	0.961	0.932	0.879	0.874	0.856	0.856	0.856	0.856	0.843	0.785	0.774	0.75	0.872
Power efficiency unit—H.P. per liter	11.38	10.43	11.28	10.82	10.88	9.54	7.14	11.28	11.42	10.65	11.00	10.59	11.43	7.76	12.39	10.75
Gasolene consumption, kilograms per H.P.-hour	0.239	0.232	0.263	0.262	0.221	0.262	0.370	0.225	0.226	0.223	02.36	0.217	0.224	0.278	0.228	0.211
Oil consumption	0.040	0.004	0.037	0.030	0.018	0.011	0.026	0.014	0.021	0.027	00.14	0.017	0.013	0.021	0.017	0.019
Prize awarded	5	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	3	.....	.....	2	1

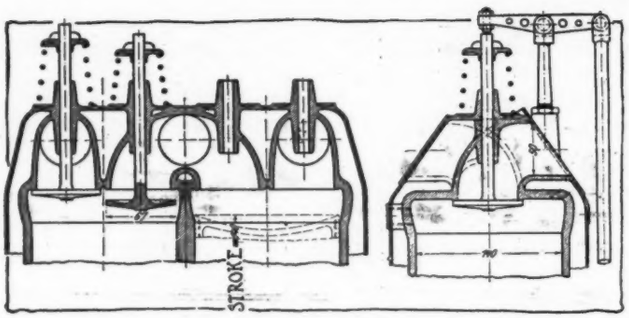


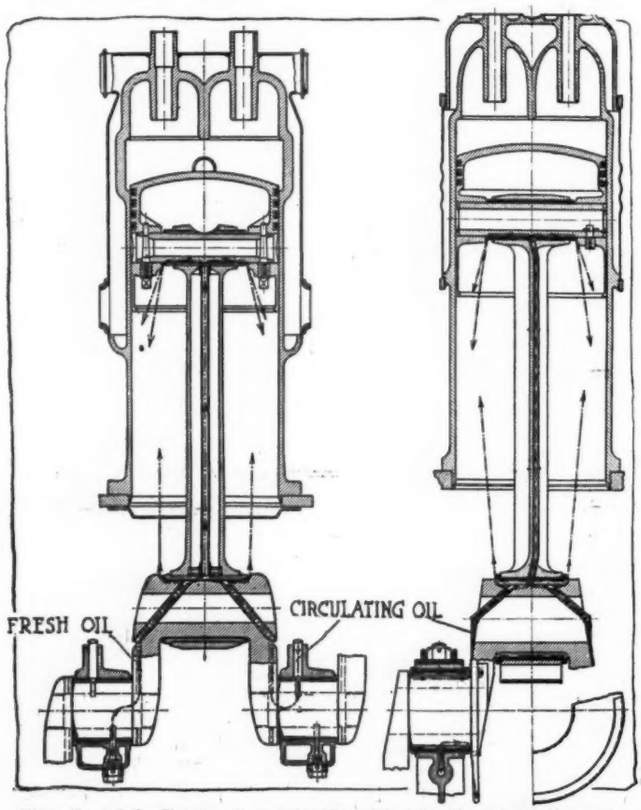
Fig. 4—The shape of combustion chambers and relative sizes of valves

sents, especially with reference to these features, an important improvement. Its efficiency unit reached 12.4 horsepowers per liter at the endurance test, while the maximum reached for the most improved rotary air-cooled motor, the new model 80-horsepower Gnôme, is only about half as high; namely 6.4. The means employed to keep the heat generated by the friction between the pistons and the cylinders as low as possible include offsetting of the crankshaft, perforations reducing the area of the piston wall and reduced thicknesses of both piston and cylinder walls.

The practical result of all these considerations is that 25 to 28 horsepowers represents the maximum which can be gotten out of each cylinder.

Gasoline Consumption and Carburetion

The high value ascribed to fuel economy in the rules of the contest had the effect that most of the motors were demonstrated 5 to 6 per cent. below their highest power capacity, as it is known that the **consumption of fuel and oil increases rapidly near the maximum power limit,** and this precaution also safeguarded the motors for the endurance trials. That the consumption figures turned out so highly favorable as shown in the table is due in part to the fact that the arrangements of the testing stands allowed a very rapid and accurate adjustment of the carbureters in advance of the main tests. **Carbureters so finely adjusted are however very sensitive to changes in temperature and barometric pressure, and small changes cause a considerable drop in the power and speed of the motor.** In flying practice a different adjustment giving higher gasoline consumption is therefore employed.



Figs. 5 and 6—Fresh oil constantly added to the circulation; ring oilers force the feed to connecting-rod and piston pin bearings

Tales Told by Color of Exhaust

The diagram, Fig. 3, gives the consumption figures for the motors with relation to the efficiency unit for each. It is noticed that the determining points fall in 3 groups. These groups could be identified at the tests by the color of the exhaust gas. The curve to the left represents the motors with a bluish-red exhaust, which indicates a very complete combustion. The motors of the middle group had yellowish-red (orange) exhaust flames and the three motors of the last group showed a deep lurid yellow [lurid—streaked with smoke] indicating poor carburetion.

Fuel Economy with Long Stroke Demonstrated

The group to the left shows plainly how the gasoline consumption grows with an increasing efficiency unit, and this relation may be explained by the less complete expansion of the combustion gases which necessarily goes with the higher unit. Secondly, the consumption is influenced by the bore-and-stroke ratio. When a curve is laid out for average power efficiency units, in accordance with the figures of the table and with 11 horsepowers per liter as the mean unit, it is seen that for approximately equal conditions the gasoline consumption grows from 210 grams per horsepower-hour for a bore-stroke ratio of 0.7 to 235 grams for a ratio of 1 (which is represented in the square motor of the fifth-prize winner with 140 millimeter bore and stroke).

Regard for Reliability Precludes High Compression

The compression ratio in the motors was rather low, ranging from 4.5 to 4.7. It has been found impossible to go higher without courting pre-ignitions and the resulting power losses and disturbances. The combustion chambers all had the compact shapes exemplified in Fig. 4.

No Settled Practice for Carbureters

Both single-jet and double-jet carbureters were used. With the latter it is only the main jet which is working at high motor speeds, while at low speeds both are working. The motors with double jet could be easily started and ran regularly at down to 300 revolutions. The results show that a lower fuel consumption is secured by the use of 1 large carbureter than by 2 small ones, and the former is, contrary to prevailing opinion, more reliable, because disturbances are mostly caused by foreign substances to which the larger jet is less sensitive than the smaller one. And, if one of two carbureters fails, the power of the motor drops at any event so rapidly that the machine must soon be brought to earth. On the other hand, in the case of six-cylinder motors, the most convenient method for avoiding disturbing cross-currents in the induction manifold is to use two carbureters.

Adjustable Pre-Heating Demanded

The unfavorable weather during the tests called for ample pre-heating of the gas mixture by means of the cooling-water or heated air. The water alone was usually insufficient. The deflectors employed to lead the air from around the hot motor were mostly removable, to obviate a drop in power during warm weather. In general, the pre-heating devices left much to be desired, being inconvenient. The best effect is obtained when both the main and the supplementary air supply are first heated moderately before mixing with the fuel (for

(*Continued on page 727.*)

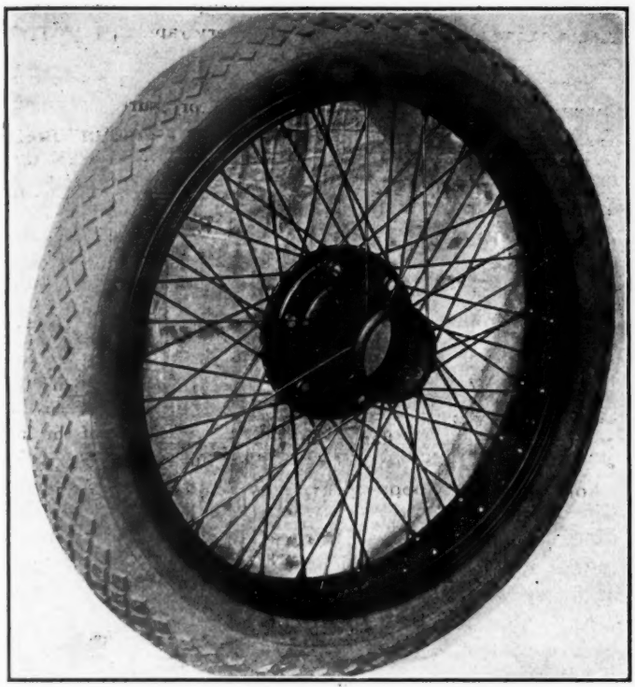


Fig. 1—Houk detachable wire wheel, showing hub construction

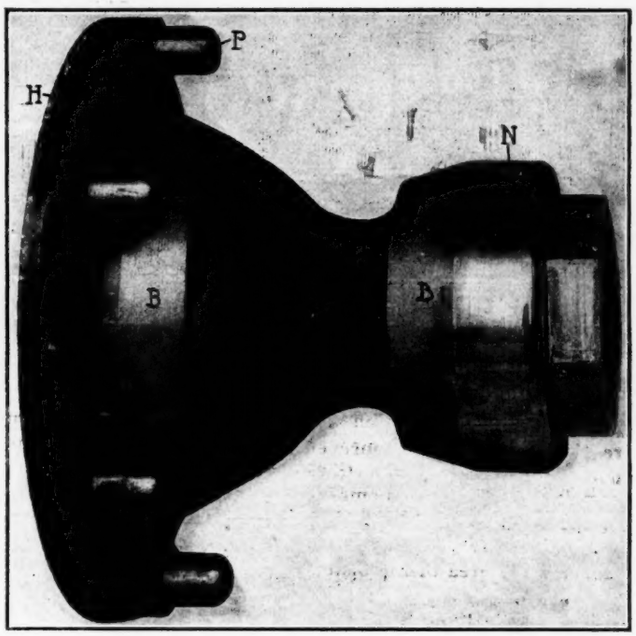


Fig. 2—Hub. N, locking nut which holds the outer hub. B and B1 are two bevel surfaces, P the driving pins and H holes for attaching to brake drum

To Make Houk Wheels

HOUK detachable wire wheels for motor cars which are made by the Houk Wire Wheel Co., Buffalo, N. Y., are wheels built under Rudge-Whitworth patents, but at a price to sell at not more than 75 per cent. of the list of the Rudge-Whitworth wheels now being made. In other words, it is a wheel intended for the medium and low-priced cars, a wheel design which admits of production suited for such a market.

This inner hub is a steel forging and carries threaded on it the locking nut N, which holds the outer hub with spokes in place. When the outer hub with the wheel is placed on it its weight is carried on the two beveled surfaces B and BI, the former on the inner hub proper and the latter, BI, on the locking nut. As the locking nut is tightened these beveled surfaces are brought closer together, clamping the wheel rigidly between them and cutting short slits in the beveled part of the locking nut. This gives the increased assurance of an additional locking nut, at this part of the construction, to prevent any loosening. This locking nut, when being screwed on, turns in the direction of the wheel when the car is moving forward, and if only started for a couple of threads will be screwed up tight within 3 minutes by the wheel rotation, but to reverse or unlock it, calls for the use of a wrench.

On this inner hub is a set of six driving pins P, which enter through six corresponding holes in the inner face of the outer hub, and surrounding each hole is a boss or short sleeve to take the driving strain of these pins against the inner hub. The holes H show where the brake drum can be attached.

This Houk wheel is being made in all sizes from those suited to the Ford up to those taking 38-inch tires. A Houck wheel taking a 36 by 4.5-inch tire weighs 37.5 pounds. These wheels will be made with inner hubs to take any standard bearing used in wood wheels and the fitting of the wire wheel can be accomplished by a garageman, in any city, who has provisions for pressing the wheel bearings into the inner hub for the wire wheel. The regular brake drums used on the wood wheels suffice for the wire wheels and no changes are necessary in brake connections or adjustments.

The Houk wheel is manufactured under Rudge-Whitworth patents and uses the triple-spoke design employed by the Rudge people. The automatic locking device is of the same principle in the Houk as in the Rudge, but worked out in a different form. With the Houk the same axle drive shafts in the rear and steering spindles in the front are used as on the artillery wood wheels and the hubs are approximately 1 inch longer with the detachable wire wheel. The wheel is fitted with Stanweld N-D rims, Nos. 51 or 52.

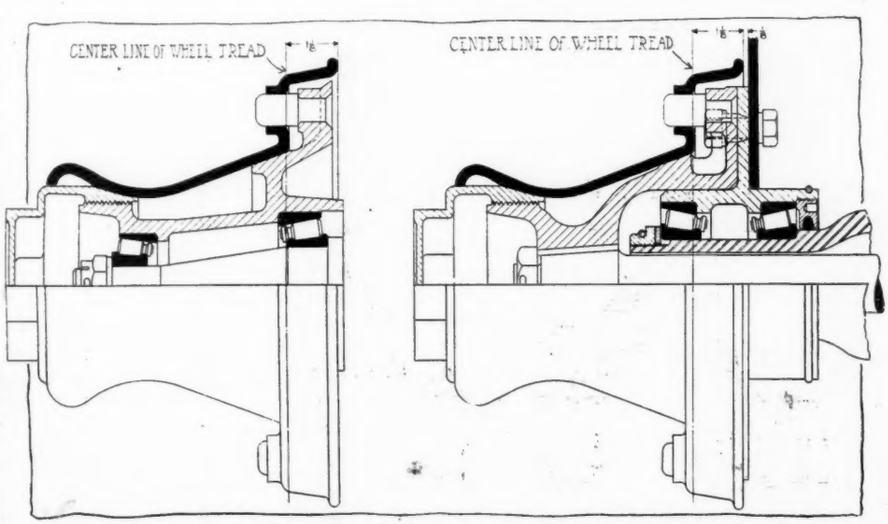


Fig. 3—Sections through back and front hubs of the new Houk detachable wire wheel

The Automobile

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Statements of Facts

ADVERTISEMENTS are primarily intended to make favorable impressions on possible customers. To make such impressions a plain statement of facts should at least constitute the nucleus around which the arguments are grouped. The presentations of these arguments, the selection of one in preference to another or its entire neglect, and the graphic presentation of one or all of the arguments constitute the differences between respective advertisements.

The arguments should be based on facts. If chrome nickle steel is not used the advertisement should not be so worded as to convey the impression that such an alloy is present. If the limits of workmanship are not .0001 inch, then no effort should be made to convey the impression that they are.

When arguments are advanced which are not founded on facts the results are generally damaging to the advertiser. While he may have made favorable impressions on possible customers, his product has not been in accordance with the impressions conveyed. In brief his advertising has been misleading. Such advertising copy may make a favorable impression once, but no more; the road to all future favorable impressions has been barred, barred for a long time. The misleading statement of the 1913 model will generally be discovered before the 1914 product is listed. The advertiser starts his 1914 campaign with a handicap, namely, the one fact that his goods failed to live up in many particulars to the impressions he conveyed. Where is the benefit in such a policy?

Reducing Car Weight

ONE of the severest problems the automobile maker has had to contend with during the last 2 or 3 years is that of weight reduction. He has found himself face-to-face with the task of giving a more flexible machine, a faster machine, a machine with a more comfortable body, a machine with a full equipment of accessories and a machine with a smaller motor. Giving the smaller and more efficient motor offers few difficulties were it possible to cut down chassis weights, but as motor dimensions have been going downward equipment has been climbing, and with more equipment has been more weight. As much as 600 pounds has been added throughout a car because of heavier bodies needed and added equipment.

Today a new chapter is confronting the maker in this small-motor, full-equipment, flexible-car era, namely, that of bringing out still smaller motors and yet maintaining, if not increasing, the flexibility of the car as well as its speed possibilities. Higher efficiencies in motors are possible, but there is a limit to load of which these little motors can take care, particularly on our poor American roads. In Europe the roads average much better than in America and consequently the small motor can handle a heavier body with a greater amount of satisfaction to the driver than can a similar motor on American roads.

A new impetus to this small motor movement is naturally added by the tariff reduction, which applies particularly to small cars listing under $2,000. What the exact status of importation under reduced tariff will be has yet to be learned, but if the foreign builder wishes to avail himself of the opportunity he at least has the chance of getting his small-motored cars into competition with American machines on a better basis than ever before. The question arises, whether the American buyer will demand the same equipment on these foreign machines that he does on home-made cars, and if he does then the added equipment weight is sure to have its effect on the foreign machine the same as it has had on the American car.

It is generally acknowledged that the foreign car has received more careful attention in the balancing of reciprocating parts and in the fitting of engine bearings than the American machine. Both of these are most important considerations in the running of a car and in its useful life, and should the foreign machine maker take advantage to the full of the present tariff changes, it will be necessary for American builders of small cars to give the maximum consideration to careful balancing of reciprocating parts as well as to reducing their weight wherever possible, and also to the fitting of bearings.

A French maker of international repute recently remarked that he could reduce his motor sizes very materially provided he fitted a gearset of five forward speeds, thereby making it possible to always keep the motor working in its zone of maximum efficiency. Foreigners have invariably been great believers in four-speed gearboxes, particularly in small cars, and it would seem that American builders who are using three-speed gearsets in their smaller cars are not taking the best measures for insuring the best possible efficiency.

Why Misleading Advertising Spoils Business

VERNON, N. Y.—Editor THE AUTOMOBILE:—Apropos your editorial on *Misleading Advertising* in a recent issue it may be said, almost since the beginning of the automobile industry, it has appeared natural for many advertisers of cars and parts to write concerning their product with a free license.

In many instances it would seem one tried to excel another in superiority of extravagant representation through unequivocal terms. It may not have been with the intention of prevarication, but the result was a distortion of truth with consequent deception.

The people who have read these flagrant misrepresentations need not be considered indifferent if, spending their time to another purpose, they have not taken issue through the press in a useless controversy. Therefore false and fraudulent statements have so far successfully passed unchallenged.

Playing With Metallurgy

To the unlearned in technical matters an atmosphere of mysterious truth has no doubt been made to surround most of the statements regarding the extraordinary inheritance of strength and endurance of parts, used in automobile construction when they were said to be peculiarly treated by an exclusive method with special reference to new combinations of steel, nickel, vanadium and so on.

One is almost forced to believe these statements, especially when a demonstration of a part in steel is set forth in a beautiful illustration accompanying the assertion.

The writer confesses to having a remarkable degree of credence created in his own mind by impressions from reading extravagant advertisements, and to being brought unexpectedly to a sense of truth with quite a mental shock, when for the first time he witnessed on a car overtaken on the road a torsion rod which had broken in the middle and in falling to the ground would have overturned the car but for its timely discovery. This particular car had been advertised as having all of the important parts made of a special steel of superior quality, which naturally created the impression that they were ordinarily fracture proof.

An inspection of this broken rod in the shop demonstrated it to be made of quite ordinary iron.

Confidence in the integrity of parts inspired from extravagant representation is suddenly transformed into amazement when some of these Herculeanized structures unexpectedly give away.

Fortunately, perhaps, the car owner forgets to make deserved criticisms in his gratitude to a kind Providence that it did not happen when in a more hazardous location, remembering that it might have been worse.

Of course at the final analysis, it is all explained by that strategic hypothesis, crystallization.

In justification of this comment the narrator begs to say he has replaced two broken spindles in the forward axle of his car this summer, one near the foot of Jacob's Ladder, going down, in the Berkshires.

It was the writer's experience, after purchasing a medium-sized car, to study the descriptive catalogue for information. About the first statement in the catalogue was the announcement that the company made its cars almost in their entirety, which, we are justified in thinking, had for its purpose an implied guarantee of materials and the assurance of co-adaptation of its associate parts. A later experience following breakage of a rear axle shaft revealed that the entire rear axle bore on its interior the stamp of a well-known axle builder. At a later time when making some adjustment it was discovered that the entire forward axle was made by another well-known axle builder.

This narrative would be incomplete if it failed to mention that the wheels were made by another company, the frame and unpainted body by others, and more. However, lest suspicion of acrimony may seem to accompany this charge, it is a pleasure to relate, the company was positively known to have made the engine, gearset, radiator and a few bolts.

Further along in this descriptive catalogue was emphasized the painstaking accuracy in fitting and adapting parts even to the one-thousandth of an inch in some places, until, following its study, the owner nearly felt he was winding a delicate watch when he cranked the motor. But imagine his chagrin when at an overhauling he found a difference in weight of 9.5 ounces between two individual reciprocating pistons and a difference of 5.5 ounces between the other pair.

Early Impressions Stand

There is little doubt that scepticism and discredit have sufficient ground for displacing the confidence unworthily placed in early representations, and in the light of present knowledge no amount of probity employed in announcing the virtues of manufactured products in cars or parts will soon overcome the reaction of the deplorable methods which have nearly ananiased the industry. —G. M. L.

Over 130,000 Automobiles and Trucks Registered in New York State

ALBANY, N. Y., Oct. 12—Automobiles to the number of 130,000 were registered under the law in this state during the 8 months preceding October. This is 30,000 more than for the corresponding period last year. New cars registered since Aug. 1, at half-rates exceeded 7,000, a gain of more than 3,000. Approximately one-half of all the motor vehicles registered represented cars of less than 25 horsepower, and that nearly 90 per cent. of these were machines of 16, 18, and 22 horsepower, while less than 1,500 were of 50 horsepower or over.

The gain in commercial vehicles, however, was the most notable, the number registered exceeding that of last year by 6,000, which represents an increase of 46 per cent., against 32 per cent. of all vehicles registered.

More dealers by 200 have been registered this year, and the aggregate number of chauffeurs licensed reached approximately 55,000, which is an increase of 10,000. The receipts showed a gain of $200,000, the aggregate being $1,235,000, which was equal to the combined receipts for the years 1910 and 1911. Thirty-seven of the sixty-one counties turned into the State Treasury $23,000 in fines.

Connecticut Car and Truck Registration Is Now Considerably Over 21,000

HARTFORD, CONN., Oct. 14—The secretary of state's office has begun distribution of the supplement to the motor vehicle register. This contains registrations made since June. Up to September 10, 21,303 automobiles were registered. The last number in the annual list was 17,945. The motorcycle registrations number 2,909. There are 331 dealers and 820 livery registrations.

Over 325,000 Fords Used in U. S.

DETROIT, MICH., Oct. 14—When the Ford Motor Co. closed its business for the year on September 30, approximately 325,000 Model T Fords were in use throughout the world, by far the larger part being driven in the United States. It means, if all the machines were owned in this country, that there would be one for one person in each 275 in the nation. In the year which just closed the company built well up toward the 200,000 mark, which had been predicted.

Exports for August, 2,044 Cars

Trucks Gain Over August 1912 Figures

WASHINGTON, D. C., Oct. 13—The bureau of statistics today made public the figures showing the exports and imports of motor cars during certain comparative periods. As briefly reported last week in THE AUTOMOBILE, the number of cars exported during August was 2,004, valued at $1,983,749. Of this number 68 were commercial cars, valued at $109,437, while the remainder, 1,936, were pleasure cars, valued at $1,874,312. During the corresponding month of last year the number of commercial cars exported was 57, valued at $107,245, while the 1,264 pleasure cars shipped abroad were valued at $1,288,354.

The exports of parts not including engines and tires, during August increased from $431,370, in 1912, to $454,881 in August last.

The exports of pleasure cars during the 8 months ended August last numbered 18,464 cars, valued at $18,484,396, while 730 commercial cars, valued at $1,260,086 were exported during the same period, the combined exports amounting to $19,744,482. During the corresponding period of 1912 the combined exports of commercial and pleasure cars numbered 16,816 cars, valued at $16,813,771. The exports of parts, not including engines and tires, during these periods, increased in value from $3,325,123, in 1912, to $3,985,658, in 1913.

The detailed exports of pleasure and commercial cars during the periods under consideration, together with the countries of destination, were as shown in the accompanying Table I.

Only 31 cars were imported into this country during August last, their value being $61,199. During August a year ago the number was 66, and the value $155,227. During the 8 months period the imports of cars declined from 533, valued at $1,237,528, in 1912, to 351, valued at $829,720, in 1913. Imports of parts, except tires, declined in value from $34,131, in August, 1912, to $18,475, in August last, and from $198,479 to $170,331 during the eight months' period.

The imports of cars during the period under consideration were received from the countries shown in Table II.

Electric Vehicle Show Opens

NEW YORK CITY, Oct. 15—The vehicle display at the Electrical Show, opened tonight at the Grand Central Palace. This display includes the newest models of both commercial and pleasure automobiles, with their accessories.

Those concerns manufacturing electric trucks which exhibit are: the General Vehicle Co., Long Island City, N. Y., General Motors Truck Co., Pontiac, Mich., Henry Tobin, Inc., New York City, who will handle the Champion electric, and the Couple-Gear Freight Wheel Co., Grand Rapids, Mich.

A few concerns manufacturing passenger electrics exhibit, among them being the Standard Electric Car Co., Jackson, Mich. The other concerns have not yet decided whether they will exhibit or not.

A number of storage battery concerns exhibit, among them being the Edison Storage Battery Co., Orange, N. J., Electric Storage Battery Co., Philadelphia, Pa., Philadelphia Storage Battery Co., Philadelphia, Pa., Gould Storage Battery Co., New York City, H. W. Johns-Manville Co., New York City and the Bell Electric Motor Co., Garwood, N. J. Those concerns not listed have as yet not decided on their show plans.

Lansden Property Is Sold

NEWARK, N. J., Oct. 14—E. G. Adams, referee in bankruptcy of the Lansden Co., will decide as to the sale of the Lansden property. This property consists of partially finished trucks and parts. The question will be decided at the bankruptcy court. At the same time the question of whether or not the trustee of the Lansden company shall carry out a contract with the City of New York for two ambulances and assume responsibility for the 1-year guarantee agreed upon will be decided.

New Policy for Kentucky Wagon

OWENSBORO, KY., Oct. 13—W. C. Nones, president of the Kentucky Wagon Mfg. Co., Louisville, Ky. has resigned, but the name of his successor has not yet been made public. Mr. Nones, though now well advanced in years, has shown himself to be a man of distinguished ability, in building up the Kentucky Wagon Mfg. Co., to one of the largest establishments of its kind in the country, and for many years, the business under Mr. Nones' able management, was very profitable, but due to changed conditions in late years, profits have fallen off, and it is believed to be the purpose of the directors to inject new blood into the organization, and adopt a more aggressive policy in the conduct of the business.

Electric Vehicle Program Out

CHICAGO, ILL., Oct. 10—The program of the Electric Vehicle Assn. of America, which will hold a convention in this city on October 27-28 is as follows: Report of committee of rates and charging stations, J. F. Gilchrist; what the sections are doing, H. E. Niesz, J. A. Hunnewell, Harvey Robinson, Day Baker; Traffic problems and the automobile, Dr. E. E. Pratt; the merchant, F. N. Carle; co-operation between the electric vehicle manufacturer and the central station, A. L. Callahan; charging of storage batteries in unattended garages, Maxwell Berry; electric vehicle salesmanship, G. H. Kelly, E. J. Bartlett; the electric vehicle in department store service, C. A. Duerr, D. F. Tobias, recent developments in the lead battery for electric vehicles, Bruce Ford; electric commercial vehicle tires, F. E. Whitney; and how to make the business healthy, Ralph Temple.

TABLE 1—EXPORTS TO FOREIGN COUNTRIES

Automobiles		August— 1912 Quantities	1912 Values	1913 Quantities	1913 Values	8 Months Ending August— 1911 Quantities	1911 Values	1912 Quantities	1912 Values	1913 Quantities	1913 Values
France	No.	51	$35,892	40	$39,453	324	$371,824	481	$368,955	607	$468,586
Germany	No.	58	45,021	70	55,577	79	98,332	310	244,747	831	734,039
Italy	No.	32	21,880	30	19,153	142	175,511	208	191,132	252	217,453
United Kingdom	No.	113	100,090	461	374,098	2,136	1,867,323	3,789	2,840,038	3,431	2,624,138
Other Europe	No.	141	111,592	91	68,308	574	541,803	1,164	971,038	1,389	1,196,415
Canada	No.	320	486,285	274	416,181	3,941	4,239,702	5,517	6,740,174	5,007	6,705,222
Mexico	No.	25	35,289	18	32,923	162	276,733	150	218,309	160	288,216
West Indies and Bermudas	No.	19	22,645	36	34,325	193	230,611	215	230,948	322	321,163
South America	No.	174	172,916	231	285,835	536	726,309	1,245	1,461,459	1,963	2,249,163
British Oceania	No.	226	212,544	284	228,389	1,261	1,153,744	2,354	2,161,049	2,157	2,056,079
Asia and other Oceania	No.	112	108,897	186	192,748	554	566,986	955	987,575	1,631	1,602,835
Other countries	No.	50	42,548	283	236,759	183	194,612	428	398,347	1,444	1,281,179
Total	No.	1,321	$1,395,599	2,004	$1,983,749	10,085	$10,443,490	16,816	$16,813,771	19,194	$19,744,482

TABLE 2—IMPORTS FROM FOREIGN COUNTRIES

Automobiles		August— 1912 Quantities	1912 Values	1913 Quantities	1913 Values	8 Months Ending August— 1911 Quantities	1911 Values	1912 Quantities	1912 Values	1913 Quantities	1913 Values
France	No.	33	$82,639	10	$22,208	209	$458,472	285	$699,881	130	$298,910
Germany	No.	3	5,705	3	3,213	116	238,163	39	92,854	75	194,487
Italy	No.	5	10,899	4	8,123	72	111,725	51	85,864	54	110,327
United Kingdom	No.	13	31,684	4	9,144	91	217,372	101	240,870	31	95,493
Other countries	No.	12	24,300	10	18,511	126	287,234	57	118,059	61	133,503
Total	No.	66	$155,227	31	$61,199	608	$1,312,969	533	$1,237,528	351	$829,720

Accessory Spaces Are Allotted

New York To Have 104 Exhibitors and Chicago 105

NEW YORK CITY, Oct. 10—At a meeting of the show and allotment committee of the Motor and Accessory Manufacturers held today at 17 West Forty-second street, the allotment of space to association members was completed for the Fourteenth Annual National Automobile shows, to be held at Grand Central Palace, New York, and the Coliseum and the First Regiment Armory, Chicago, January 3 to 10 and 24 to 31, respectively, 1914.

This year's show has brought out more accessory exhibitors than heretofore. Space, which was to have been allotted to some of the automobile exhibitors, has now been held for the accessory people.

There will be 104 accessory exhibits at the New York show and 105 at the Chicago show.

Although the Republic, Kelly-Springfield, Fisk, Goodrich, Ajax-Grieb, Swinehart, Firestone, Goodyear, Diamond, Michelin, Federal and United States tire companies stated last week that they would not exhibit, the list includes the two following tire concerns: Pennsylvania Rubber Co., Jeannette, Pa., and the Empire Rubber & Tire Co., New York City. These concerns have not as yet been given any space, while the Double Fabric Tire Co., Auburn, Ind., has been given space at both shows.

No new concerns in the ball bearing and axle fields have announced their intention of participating in the coming shows. Marburg Bros, Inc., is the only concern thus far, which has announced its intention of exhibiting, but it has not as yet been given any space.

St. Louis Show a Success

ST. LOUIS, Mo., Oct. 11—With many of the leading dealers holding private displays the seventh annual automobile show of the St. Louis Automobile Manufacturers' and Dealers' Association opened and closed here this week. According to the show managers this year's display at Forest Park Highlands was the best held under the association's direction in many years. To the Missouri Motor Car Co. goes the distinction of selling the first car during the show. Monday evening it disposed of a Marmon 32 horsepower five-passenger touring car.

The attendance at this year's show was far better than at any previous year because of the many visitors in the city.

Milwaukee Show January 10-16

MILWAUKEE, WIS., Oct. 14—The sixth annual Milwaukee motor show will be held in the Auditorium at Milwaukee from January 10 to 16 inclusive, according to preliminary announcement made by Bart J. Ruddle, who has managed the last three exhibitions given by the Milwaukee dealers. The Milwaukee show will follow the New York show and there will be a lapse of 1 week between the Milwaukee and Chicago shows. Applications for space have already been mailed to prospective exhibitors and it is believed that the requisitions may be so heavy as to require the use of the two second floor halls of the Auditorium in addition to the main arena corridor, lobby and two smaller halls on the ground floor, which have been used in previous years.

New York Show

American Bronze Co.....Berwyn, Pa.
American Hardware Corp.....New Britain, Conn.
Automobile Supply Mfg. Co.....Brooklyn, N. Y.
Apple Electric Co.....Dayton, O.
Badger Brass Mfg. Co.....Kenosha, Wis.
Benford Mfg. Co.....New York City.
Blackledge Mfg. Co., John W.....Chicago, Ill.
Bowser & Co. S. F.....Fort Wayne, Ind.
Breeze Carbureter Co.....Newark, N. J.
Brown-Lipe Chapin Co.....Syracuse, N. Y.
Buda Co., The.....Harvey, Ill.
Budd Mfg. Co., Edw. G.....Philadelphia, Pa.
Byrne, Kingston & Co.....Kokomo, Ind.
Carnegie Steel Co.....Pittsburg, Pa.
Carr Co., F. S.....Chicago, Ill.
Champion Ignition Co.....Toledo, O.
Chase & Co., L. C.....Chicago, Ill.
Coes Wrench Co.....Worcester, Mass.
Cook's Sons, Adam.....New York City.
Cowles & Co., C.....New Haven, Conn.
Cramp & Sons Ship & Engine Bldg. Co., Wm.....Philadelphia, Pa.
Dean Electric Co.....Elyria, O.
Detroit Electric Appliance Co.....Detroit, Mich.
Detroit Lubricator Co.....Detroit, Mich.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Doehler Die Casting Co.....Detroit, Mich.
Double Fabric Tire Co.....Auburn, Ind.
Dykes Co., John L. G.....Chicago, Ill.
Dyneto Electric Co.....Syracuse, N. Y.
Edison Storage Battery Co.....Orange, N. J.
Edmunds & Jones Mfg. Co.....Detroit, Mich.
Electric Auto-Lite Co.....Toledo, O.
Electric Storage Battery Co.....Philadelphia, Pa.
Findeisen & Kropf Mfg. Co.....Chicago, Ill.
Gabriel Horn Mfg. Co.....Cleveland, O.
Garage Equipment Mfg. Co.....Milwaukee, Wis.
Gemmer-Detroit Starter Co.....Detroit, Mich.
Globe Machine & Stamping Co.....Cleveland, O.
Gray & Davis.....Boston, Mass.
Harris Oil Co., A. W.....Chicago, Ill.
Hartford Machine Screw Co.....Hartford, Conn.
Hartford Suspension Co.....Jersey City, N. J.
Haws, George A.....New York City.
Hayes Mfg. Co.....Detroit, Mich.
Heinze Electric Co.....Lowell, Mass.
Herz & Co.....New York City.
Hoffecker Co., The.....Boston, Mass.
Ignition Starter Co.....Detroit, Mich.
International Acheson Graphite Co., Niagara Falls, N. Y.
J. M. Shock Absorber Co.....Philadelphia, Pa.
Janney-Steinmetz & Co.....Philadelphia, Pa.
Kellogg Mfg. Co.....Rochester, N. Y.
Kent Mfg. Works, Atwater.....Philadelphia, Pa.
Leather Tire Goods Co.....Niagara Falls, N. Y.
Light Mfg. & Foundry Co.....Pottstown, Pa.
Link-Belt Co.....Philadelphia, Pa.
Manufacturers Foundry Co., The...Waterbury, Conn.
Mezger, C. A.....New York City.
Mosler & Co. A. R.....New York City.
Motometer Co.....New York City.
Motsinger Device Mfg. Co.....Lafayette, Ind.
National Coil Co.....Lansing, Mich.
National Lead Co.....New York City.
National Tube Co.....Pittsburg, Pa.
N. Y. & N. J. Lubricant Co.....New York City.
North East Electric Co.....Rochester, N. Y.
Oliver Mfg. Co.....Chicago, Ill.
Pantasote Co., The.....New York City.
Piel Co., The G.....Long Island City, N. Y.
Randall-Faichney Co.....Boston, Mass.
Remy Electric Co.....Anderson, Ind.
Reynolds-Browne Co.....Chicago, Ill.
Rose Mfg. Co.....Philadelphia, Pa.
Royal Equipment Co., The.....Bridgeport, Conn.
Sager Co., J. H.....Rochester, N. Y.
Schoen-Jackson Co.....Media, Pa.
Schrader's Son, Inc., A.....New York City.
Schwarz Wheel Co., The.....Philadelphia, Pa.
Shaler Co., C. A.....Waupun, Wis.
Simms Magneto Co.....New York City.
Sireno Co., The.....New York City.
Spacke Machine Co., F. W.....Indianapolis, Ind.
Sparks-Withington Co.....Jackson, Mich.
Spicer Mfg. Co.....Plainfield, N. J.
Splitdorf Electrical Co.....Newark, N. J.
Springfield Metal Body Co.....Springfield, Mass.
Standard Thermometer Co.....Boston, Mass.
Standard Welding Co.....Cleveland, O.
Stewart & Clark Mfg. Co.....New York City.
Stromberg Motor Devices Co.....Chicago, Ill.
Torbensen Gear & Axle Co.....Newark, N. J.
U. S. Light & Heating Co.....New York City.
Vacuum Oil Co.....Rochester, N. Y.
Valentine & Co.....New York City.
Veeder Mfg. Co.....Hartford, Conn.
Vesta Accumulator Co.....Chicago, Ill.
Vorhees Rubber Mfg. Co.....Jersey City, N. J.
Warner Gear Co.....Muncie, Ind.
Warner Mfg. Co., The.....Toledo, O.
Weed Chain Tire Grip Co.....New York City.
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.
Wheeler & Schebler.....Indianapolis, Ind.
White & Bagley Co.....Worcester, Mass.
Willard Storage Battery Co.....Cleveland, O.

Chicago Show

American Bronze Co.....Berwyn, Pa.
American Hardware Corp.....New Britain, Conn.
Apple Electric Co.....Dayton, O.
Automobile Supply Mfg. Co.....Brooklyn, N. Y.
Auto Parts Mfg. Co.....Detroit, Mich.
Badger Brass Mfg. Co.....Kenosha, Wis.
Baldwin Chain & Mfg. Co.....New York City.
Benford Mfg. Co.....New York City.
Blackledge Mfg. Co., John W.....Chicago, Ill.
Bowser & Co., S. F.....Fort Wayne, Ind.
Brown-Lipe Chapin Co.....Syracuse, N. Y.
Buda Co., The.....Harvey, Ill.
Byrne, Kingston & Co.....Kokomo, Ind.
Carr Co., F. S.....Chicago, Ill.
Champion Ignition Co.....Toledo, O.
Continental Motor Mfg. Co.....Detroit, Mich.
Cook's Sons, Adam.....New York City.
Cotta Transmission Co.....Rockford, Ill.
Cowles & Co., C.....New Haven, Conn.
Cramp & Sons Ship & Engine Bldg. Co., Wm.....Philadelphia, Pa.
Dean Electric Co.....Elyria, O.
Detroit Electric Appliance Co.....Detroit, Mich.
Detroit Lubricator Co.....Detroit, Mich.
Diamond Chain & Mfg. Co.....Indianapolis, Ind.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Doehler Die Casting Co.....Detroit, Mich.
Double Fabric Tire Co.....Auburn, Ind.
Dykes Co., John L. G.....Chicago, Ill.
Dyneto Electric Co.....Syracuse, N. Y.
Edison Storage Battery Co.....Orange, N. J.
Edmunds & Jones Mfg. Co.....Detroit, Mich.
Electric Auto-Lite Co.....Toledo, O.
Electric Storage Battery Co.....Philadelphia, Pa.
Findeisen & Kropf Mfg. Co.....Chicago, Ill.
Gabriel Horn Mfg. Co.....Cleveland, O.
Garage Equipment Mfg. Co.....Milwaukee, Wis.
Gemmer-Detroit Starter Co.....Detroit, Mich.
Globe Machine & Stamping Co.....Cleveland, O.
Gould Storage Battery Co.....New York City.
Gray & Davis.....Boston, Mass.
Harris Oil Co., A. W.....Chicago, Ill.
Hartford Suspension Co.....Jersey City, N. J.
Hayes Mfg. Co.....Detroit, Mich.
Heinze Electric Co.....Lowell, Mass.
Hess Spring & Axle Co.....Carthage, O.
Hoffecker Co., The.....Boston, Mass.
Imperial Brass Mfg. Co.....Chicago, Ill.
Ignition Starter Co.....Detroit, Mich.
International Acheson Graphite Co., Niagara Falls, N. Y.
J. M. Shock Absorber Co.....Philadelphia, Pa.
Kellogg Mfg. Co.....Rochester, N. Y.
Kent Mfg. Works, Atwater.....Philadelphia, Pa.
Leather Tire Goods Co.....Niagara Falls, N. Y.
Lovell-McConnell Mfg. Co.....Newark, N. J.
McCord Mfg. Co.....Detroit, Mich.
Mezger, C. A.....New York City.
Mosler & Co., A. R.....New York City.
Motometer Co.....New York City.
Motsinger Device Mfg. Co.....Lafayette, Ind.
National Coil Co.....Lansing, Mich.
National Lead Co.....New York City.
National Tube Co.....Pittsburg, Pa.
N. Y. & N. J. Lubricant Co.....New York City.
North East Electric Co.....Rochester, N. Y.
Oliver Mfg. Co.....Chicago, Ill.
Pantasote Co., The.....New York City.
Piel Co., The G.....Long Island City, N. Y.
Randall-Faichney Co.....Boston, Mass.
Remy Electric Co.....Anderson, Ind.
Reynolds-Browne Co.....Chicago, Ill.
Rose Mfg. Co.....Philadelphia, Pa.
Royal Equipment Co.....Bridgeport, Conn.
Rutenber Motor Co.....Marion, Ind.
Sager Co., J. H.....Rochester, N. Y.
Schoen-Jackson Co.....Media, Pa.
Schrader's Son, Inc., A.....New York City.
Schwarz Wheel Co., The.....Philadelphia, Pa.
Shaler Co., C. A.....Waupun, Wis.
Simms Magneto Co.....New York City.
Sireno Co., The.....New York City.
Sparks-Withington Co., The.....Jackson, Mich.
Spicer Mfg. Co.....Plainfield, N. J.
Splitdorf Electrical Co.....Newark, N. J.
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Vacuum Oil Co.....Rochester, N. Y.
Valentine & Co.....New York City.
Veeder Mfg. Co.....Hartford, Conn.
Vesta Accumulator Co.....Chicago, Ill.
Vorhees Rubber Mfg. Co.....Jersey City, N. J.
Warner Gear Co.....Muncie, Ind.
Warner Mfg. Co.....Toledo, O.
Waukesha Motor Co.....Waukesha, Wis.
Weed Chain Tire Grip Co.....New York City.
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.
Wheeler & Schebler.....Indianapolis, Ind.
White & Bagley Co.....Worcester, Mass.
Whitney Mfg. Co.....Hartford, Conn.
Willard Storage Battery Co.....Cleveland, O.

Automobile Securities Quotations

A few changes on a higher scale than last week's occurred in the security quotations. Ajax-Grieb Rubber Co. common dropped 5 points; Garford Co. preferred dropped 5 points, as did that of the Miller Rubber Co., and the Swinehart Tire Co. The Peerless Motor Co. also dropped 8 points, its bid being 33.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com.	150	175	150	..
Ajax-Grieb Rubber Co., pfd.	95	100	94	100
Aluminum Castings, pfd.	100	102	98	100
Chalmers Motor Company, com.	..	..	..	102
Chalmers Motor Company, p.d.	..	..	..	102
Consolidated Rubber Tire Co., com.	13	15	34	36
Consolidated Rubber Tire Co., pfd.	50	60	94	96
Firestone Tire & Rubber Co., com.	270	275	267	270
Firestone Tire & Rubber Co., pfd.	106	107½	102	104
Garford Company, pfd.	99	100	85	91½
General Motors Company, com.	34	36	38	39¼
General Motors Company, pfd.	74½	77½	80½	81½
B. F. Goodrich Company, com.	72	73	23	24¾
B. F. Goodrich Company, pfd.	106	106½	88	90
Goodyear Tire & Rubber Co., com.	375	380	284	288
Goodyear Tire & Rubber Co., pfd.	104½	105½	97½	98½
Gray & Davis Co., pfd.	..	..	..	102
Hayes Manufacturing Company	..	92	..	..
International Motor Co., com.	18	21	..	5
International Motor Co., pfd.	78	81	10	15
Lozier Motor Company, com.	..	..	15	..
Lozier Motor Company, pfd.	..	..	..	90
Maxwell Motor Co., com.	..	..	2	3
Maxwell Motor Co., 1st pfd.	..	..	24	26
Maxwell Motor Co., 2d pfd.	..	..	5½	7
Miller Rubber Company	130	140	130	135
Packard Motor Company, pfd.	105½	107	95	100
Peerless Motor Company, com.	..	..	25	35
Peerless Motor Company, pfd.	..	..	85	90
Pope Manufacturing Company, com.	35	37	..	9
Pope Manufacturing Company, pfd.	73	75	..	30
Portage Rubber Co., com.	..	..	..	40
Portage Rubber Co., pfd.	..	..	..	95
Reo Motor Truck Company	..	10½	9	10
Reo Motor Car Company	..	23	16½	17¾
Rubber Goods Mfg. Co., pfd.	..	..	100	106
Stewart Warner Speedometer Co., com.	..	..	65	..
Stewart Warner Speedometer Co., pfd.	..	..	94	98
Studebaker Company, com.	40	42	20	22
Studebaker Company, pfd.	94	95½	75	77
Swinehart Tire Company	99	100	80	85
U. S. Rubber Co., com.	..	..	61¾	62½
U. S. Rubber Co., 1st pfd.	..	..	105½	106½
White Company, pfd.	105	108	105	110
Willys-Overland Company, com.	..	..	66	68
Willys-Overland Company, pfd.	..	..	85	92

Standard Motor Co. of Minneapolis Proposes To Erect $3,000,000 Factory

MINNEAPOLIS, MINN., Oct. 13—With a capital of $6,000,000 and the purpose to erect a $3,000,000 plant the new Standard Motor Co., of Minneapolis, Minn., plans a big business. The company will absorb the Colby Motor Co., of Mason City, Ia., maker of the Colby car, and the Minneapolis Motor Co., builder of the Minneapolis motorcycle. The company will make every type of pleasure car and light delivery cars, and may continue to make the motorcycle. Five hundred men will be employed and the output will be valued at about five million dollars a year. Several sites are under consideration. Wealthy men are said to be back of the plant including F. E. Kenaston, president of the Minneapolis Threshing Machine Co., M. J. Scanlon, S. H. Bowman and P. M. Starnes, lumbermen of national reputation; C. H. McNider, Mason City banker, and William Colby, head of the Colby company; S. J. Beal, St. Paul, and F. E. Starnes, of Minneapolis.

New Electric Furnace Steel Plant

INDIANAPOLIS, IND., Oct., 13—Steel, especially adapted to the manufacture of motor cars, is to be manufactured in this city by the newly organized Electric Steel Co. of Indiana. This will be the first steel manufacturing plant in the city and one of the few concerns manufacturing steel by means of electric furnaces in the United States.

The new company has been incorporated with an authorized capitalization of $100,000 by George A. Weidley, vice-president of the Premier Motor Manufacturing Co.; Chester P. Wilson, vice-president, later State Public Service Co.; Hugh McK. Landon, of the Indianapolis Water Company; J. B. Forrest, general manager of the Citizens Gas Co. and H. H. Burkman, Jr., chemical and metallurgical engineer.

Mr. Burkman is the inventor of the electric furnace and process which will be used. The electric furnace process is said to produce a steel that is stronger and lighter than steel manufactured by other processes. Such steel will be of great service in automobile work to decrease weight.

Reo Surplus $2,061,887

Financial Statement for Past Year Makes Splendid Showing—Material Increase in Facilities

LANSING, MICH., Oct. 14—The annual meeting of the Reo Motor Car Co. was held on Thursday, October 9, and was largely attended. The financial statement as submitted to the stockholders shows the company to be in a very satisfactory condition as will be seen from the following:

ASSETS

Capital Assets:	
Real estate, buildings, machinery, plant equipment and other assets	$2,019,356.17
Current Assets:	
Inventories, accounts receivable, etc.	1,312,734.42
Cash on hand and in banks	885,383.61
	$4,217,474.20

LIABILITIES

Capital Stock:	
200,000 shares of par value of $10.00 each	$2,000,000.00
Current liabilities	155,586.80
Surplus account	2,061,887.40
	$4,217,474.20

The company during the past year has made a material increase in its facilities by building a warehouse and various other additions. It has also made material additions to its machinery equipment. The report of business done shows that the company has just ended one of the most successful years it has had since its organization. The management will remain in the same hands during the coming year as in the past.

International Affairs Favorable

NEW YORK CITY, Oct. 14—The stockholders of the International Motors Co., manufacturing Mack, Saurer and Hewitt trucks have not been asked to authorize a mortgage of $1,200,000 as was rumored last week. The meeting called last Tuesday was for the purpose of pledging $1,200,000 of the International company's assets as security for a loan still to be arranged. Just how much will be needed is not known nor has the manner of raising the money been decided upon. A meeting is called for Tuesday, Oct. 21.

As all the preferred stock is in the hands of voting trustees, the matter could be approved by the trustees without further formality. The trustees felt, however, that the shareholders should be consulted.

John Calder, president of the company, states that it is practically certain that the officers will obtain consent to the plan.

Hoover To Make Cyclecar

ST. LOUIS, MO., Oct. 14—H. H. Hoover, former designing engineer of Detroit, is forming a company in St. Louis to manufacture and market a small two-passenger cyclecar with wire wheels and sprocket-chain drive. The car is to be sold for $375 so as to supply a field now entirely unsupplied.

The new car has a tread of 36 inches and a wheelbase of 84 inches. It has a one-cylinder, 5-horsepower air-cooled motor. The car, which is underslung, weighs about 350 pounds. It has no fenders and is cranked from the side. Hoover says he frequently has made 55 miles on 1 gallon of gasoline.

DETROIT, MICH., Oct. 14—Detroit's most recent cyclecar manufacturing concern is the Hawk Motor Car Co., which has been incorporated here for $50,000 with F. S. Salter, W. W. McIntyre and Duane Tinnitts as the principal stockholders.

Anglada To Make Cyclecar

NEW YORK CITY, Oct. 15—Joseph Anglada has announced that he has resigned his presidency in the rim company which bears his name to become actively engaged in the manufacture of a cyclecar. The designs have been practically completed and the car will probably be ready for the market this coming season.

Tone of Rubber Markets Easier

NEW YORK CITY, Oct. 15—An easier tone developed in the leading world's crude rubber markets, fine up-river Para calling at 77 and 78 cents. In New York the market was dull, the demand apparently being confined to a few small lots on the basis of the above-priced rubber. In the English market the demand was apparently limited to small lots, and the trend of both the Brazilian and the plantation grades was downward.

To Add $6,000,000?

Packard Directors May Increase Company's Stock from $10,000,000 to $16,000,000

DETROIT, MICH., Oct. 13—The directors of the Packard Motor Car Co. have called a meeting of the stockholders for Oct. 16 when action will be taken on recommendations made by the directors for an increase in the company's capital stock. The plan submitted contemplates the increasing of the present capital stock of $10,000,000 to $16,000,000, half of this $6,000,000 being 7 per cent. preferred stock and the other half common. At the present time, the Packard company has $5,000,000 of each.

It is proposed, if the recommendations are approved, to distribute $2,000,000, par value of the new common stock as a stock dividend among present owners of the company's common stock. It is understood that these holders of common will then be asked to waive their right to subscribe for the remaining $1,000,000 of new common and the $3,000,000 of new preferred, this to be retained for the present as treasury stock to be placed with selected purchasers not now identified with the Packard company.

Willys-Overland Co. Earns $5,705,537 Net

NEW YORK CITY, Oct. 15—Net earnings of the Willys-Overland Co. for the year ended June 30, exceeded all expectations by reaching $5,705,537. After allowing for interest and dividends $3,070,959 went to surplus account. Net of $5,653,898 is equal to sixteen times the dividend requirement on the preferred stock. Earnings available for the common shares equalled 26.5 per cent.

De Witt Co. Increases Capacity

DETROIT, MICH., Oct. 15—*Special Telegram*—The Jeffery De Witt Co. has begun operations on the three-story addition to its porcelain insulator and spark-plug-making plants in this city. The new building will measure 53 by 100 feet. This expansion follows the re-incorporation of the concern under Maine laws for $500,000. It was formerly a New Jersey corporation, with a capital stock of $50,000. The new stock is practically all taken up by the present stockholders it is said. When the additions are completed, the concern's spark-plug output will be increased from 5,000 plugs per day to twice that number.

McLain Purchases Franklin Branch

SAN FRANCISCO, CAL., Oct. 12—The local branch of the Franklin Automobile Co., Syracuse, N. Y., has been purchased by J. F. McLain. He has been the branch manager since it opened in 1909 and during that time has also been district sales manager for the Pacific Coast. The taking over of the San Francisco branch by him is following out the policy of the parent company to place its employees in business at favorable retail points.

Western Motor Company Insolvent

DAVENPORT, IA., Oct. 10—Creditors of the Western Implement & Motor Co. yesterday secured the appointment of a receiver by Judge Smith McPherson of the Federal Court. The company is said to owe $100,000, with assets of $50,000. This concern manufactures tractor engines.

Cutting Plant Sale October 22

JACKSON, MICH., Oct. 10—The sale of the entire plant of the Cutting Motor Car Co., consisting of real estate, buildings and permanent fixtures of the appraised value of $65,000, will be held on the premises on October 22.

TOLEDO, O., Oct. 12—The Willys-Overland Co. has purchased the Globe Ball Bearing Company of Norwich, Conn. The entire machinery of the concern is being moved to Elmira, N. Y., where it will be reestablished in connection with the Morrow Manufacturing Co., another subsidiary of the Overland Company.

INDIANAPOLIS, IND., Oct. 13—Harry Tuttle, formerly with the Stoddard-Dayton and Howard companies, has joined the sales force of the Lyons Atlas Co., and is now traveling in the New England states, establishing agencies.

Market Changes of the Week

A tendency for lower prices prevailed in this week's markets. Antimony broke its usual calmness and dropped to $0.06 1-4 per pound. Both electrolytic and Lake coppers dropped to $0.16 1-8 and $0.16 3-4 per pound, respectively. Business on Tuesday in electrolytic copper was dull and prices were lower. Some sales for November and December shipment were made by second hands in New York City. Cottonseed oil fluctuated throughout the week and closed at $6.88 per barrel at a loss of $0.10. Lead came down to $4.45 per 100 pounds at a loss of $0.05. Tin was quiet but steady at the end of the week, small sales of nearby positions for interior shipment being recorded. In the local market there was little demand except for small lots from consumers in the interior and as a consequence tin dropped to $40.35, at a loss of $0.10 per 100 pounds.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.....	.07½	.07½	.07½	.07½	.07½	.06¼	— .01¼
Beams & Channels, 100 lbs....	1.56	1.56	1.56	1.56	1.56	1.56	.....
Bessemer Steel, ton.....	23.00	23.00	23.00	23.00	23.00	23.00	.....
Copper, Elec., lb..	.16½	.16½	.16⅜	.16⅜	.16⅜	.16½	— .00⅜
Copper, Lake, lb.	.16⅞	.16¾	.16⅝	.16⅝	.16⅝	.16¾	— .00⅛
Cottonseed Oil, lb.	6.98	6.99	7.00	6.90	6.99	6.88	— .10
Cyanide Potash, lb.....	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown..	.38	.38	.38	.38	.38	.38	.....
Gasoline, Auto, 200 gals.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime...	.95	.95	.95	.95	.95	.95	.....
Lead, 100 lbs.....	4.50	4.45	4.45	4.45	4.45	4.45	— .05
Linseed Oil.....	.50	.50	.50	.50	.50	.50	.....
Open-Hearth Steel, ton.....	23.00	23.00	23.00	23.00	23.00	23.00	.....
Petroleum, bbl., Kansas crude...	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, raw Italy....	....	....	5.25	....	5.20	5.25	.....
Silk, raw Japan...	....	....	4.20	....	4.20	4.20	.....
Sulphuric Acid, 60 Baume.....	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.....	40.45	40.50	40.35	40.75	40.35	40.35	— .10
Tire, Scrap.....	.08¼	.08¼	.08¼	.08¼	.08¼	.08¼	.....

Babcock and Millard Leave Howard for Van Auken Electric

CONNERSVILLE, IND., Oct. 13—Guilford C. Babcock and Clarence L. Millard have severed connection with the Howard Motor Car Co., Connersville, Ind., E. W. Ansted, succeeding Mr. Babcock as president, and F. B. Ansted succeeding Mr. Willard as vice-president and treasurer.

Guilford C. Babcock has been elected vice-president and treasurer of the Van Auken Electric Car Co., Connersville, Ind., and C. L. Millard, secretary. Both are giving active attention to the Van Auken electric delivery, a $1,000 light delivery car.

While the offices of the Van Auken Company have been in Connersville, Ind., headquarters will shortly be removed to Chicago, office space having been already taken in the City Hall Building, Chicago.

The retirement of Messrs. Babcock and Millard from the Howard Motor Car Co. is made easy from the fact that the Howard Six was manufactured for them under contract by a company controlled by Messrs. E. W. and F. B. Ansted, so that the change in reality means that the makers of the Howard Six will also control the selling end, the manufacturing and selling interests being virtually consolidated by Messrs. Ansted assuming active control of the Howard Motor Car Co., as well as already controlling the company owning the plant in which the Howard Six was made under contract.

Dayton Truck in Receiver's Hands

DAYTON, O., Oct. 15—With liabilities of $216,165.77, all but $9,000 of which is unsecured, and assets listed at $67,720.28, the Dayton Auto Truck Co., Dayton, O., yesterday through its president, R. T. Johnson, of Dayton, and attorney Lee Warren James, filed a voluntary petition in bankruptcy in the United States District Court. Mr. Johnson is the largest of the unsecured creditors listed. He holds fourteen notes aggregating $113,773.85, and is also listed as holding a claim of $41,397.21, due from the company on an account. The company sets out in its schedules that practically all of its books were damaged by the flood of March 25, but there is no intimation as to the cause of its failure.

Banquet by the Manhattan Automobile Club to M. R. Connolly and H. Leavitt, of Queens County in recognition of their road work

Chicago Automobile Club Wins Run

Defeats Chicago Athletic Club Team for Allen S. Ray and Carleton White Trophies

CHICAGO, ILL., Oct. 11—The Chicago Automobile Club won both the Allen S. Ray and the Carleton White trophies yesterday in the annual fall team match with the Chicago Athletic Association, the first for having the fewest points' penalty—10 to 26—and the latter for having the greatest number of perfect scores—nine to ten. This was the ninth meeting of the two teams in the last 6 years, but only the second time the Chicago Automobile Club has won. Its last previous victory was in 1908.

The run yesterday was to Hudson Lake, Ind., and return, 170 miles, and was made remarkable by the participation in the tour of Mayor Carter H. Harrison of Chicago, who was the guest of honor and who not only made the trial, but stayed for the banquet given by the losers last night at the South Shore Country Club. The mayor delivered a speech in which he advocated the improvement of city and country roads and also declared his intention of creating a commission, on which the motorists will be well represented, which will pass upon ordinances pertaining to motoring and traffic before they are presented to the council. In other words, the mayor believes that such legislation should be reasonable and sane and he is willing to listen to the motorists.

Each team in the match had eleven cars and of the total of twenty-two only five were penalized and those for trivial causes.

Chicago Automobile Club

NO.	DRIVER AND CAR	PENALTY	CREDIT
2.	J. E. Callender, Edwards-Knight	0	5
4.	G. F. Ballou, Apperson	0	5
6.	C. G. Sinsabaugh, Chalmers	0	5
8.	A. M. Robbins, Alco	1	0
10.	R. L. Parker, Stearns-Knight	9	0
12.	W. D. Morris, Winton	0	5
14.	J. Debits, Buick Six	0	5
16.	P. E. Ennis, Marmon	0	5
18.	O. B. Duncan, Falcar	0	5
20.	Thomas J. Hay, Hupmobile	0	5
22.	J. T. Brown, Velie	0	5
	Totals	10	45

For each perfect score the team is allowed 5 points credit, which makes the C. A. C. score 35 plus.

Chicago Athletic Association

1.	C. T. Knisely, Diamond T	0	5
3.	W. F. Grower, Diamond T	0	5
5.	W. C. Thorne, Locomobile	0	5
7.	N. H. Van Sicklen, Cole	0	5
9.	C. F. Meyer, Peerless	0	5
11.	S. W. Hamm, Cole	0	5
13.	H. B. Staver, Staver	0	5
15.	F. E. Mann, Locomobile	19	0
17.	W. B. Simpson, Packard	6	0
19.	S. E. Hibben, Packard	0	5
21.	L. T. Jaques, Peerless	1	0
	Total	26	40

C. A. A. score, 14 plus.

Assembly of the Mudlarks at Holley Arms, Hewlett, L. I. Left to right—Top row: S. W. Seeley, Ed. Korbel, Becky Sharpe, Duncan Curry, W. White, D. Beecroft. Second row: F. J. Wagner, Fred Wagner, Jr., H. Unwin, H. M. Swetland, S. M. Dampman, J. G. Perrin. Third row: H. W. Perry, M. Reeves, J. C. Wetmore, M. L. Dorris, L. R. Smith. Bottom: F. Ed. Spooner, H. G. Reynolds, H. Gillette, R. H. Johnson, J. J. Donovan

Excelsior Averages 101 m.p.h. at Ostend

OSTEND, Oct. 3—In the kilometer, 5/8 mile, straightaway trials held here, fastest work has been done by Christiaens on his six-cylinder Grand Prix Excelsior, with which he touched 100.76 miles an hour. In the touring car classes the fastest was Erle on a Benz, at an average speed of 88.77 miles an hour. The tabulated results are as follows:

RACING CARS

Excelsior	25 1/5	average	100.76	miles
Excelsior	28 4/5	"	77.67	"
Sava	30 3/5	"	73.09	"
Ama	34 1/5	"	65.40	"
Hispano-Suiza	34 2/5	"	65.02	"
Excelsior	34 4/5	"	64.28	"
Excelsior	35 4/5	"	62.48	"
F.A.B.	36 1/5	"	61.79	"
Excelsior	36 2/5	"	61.45	"
Excelsior	36 3/5	"	61.12	"
Mors	38 2/5	"	58.25	"
F.N.	40 1/5	"	55.64	"

TOURING CARS

Benz	25 1/5	"	88.77	"
Sava	33 2/5	"	66.97	"
Benz	30 2/5	"	73.58	"
S.P.A.	37 4/5	"	59.17	"
Metallurgique	39 3/5	"	56.49	"
Excelsior	40 4/5	"	54.82	"
Mors	45	"	49.71	"
F.A.B.	46 4/5	"	47.79	"

Record Broken at Denver Hill Climb

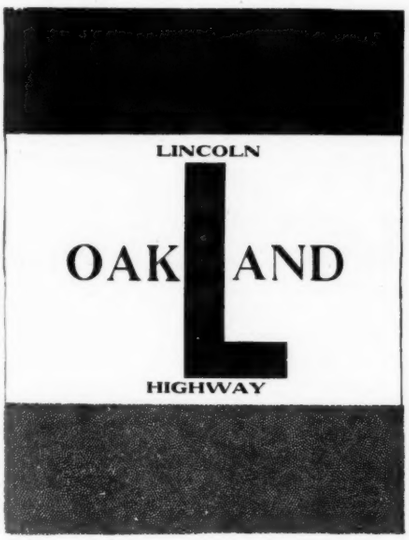
Turner, in Maxwell 25, Covers Difficult and Dangerous Course in 11:32.4

DENVER, COL., Oct. 12—The Denver Motor Club's first annual hill-climb at Mt. Falcon yesterday afternoon resulted in a surprising record of 11 minutes 32 2-5 seconds for the 3.5-mile steep and picturesque course. The best time previously made in any unofficial, trial climb was 22 minutes. The grade at some points is as high as 20 per cent.

The new record was made with a 25-horsepower Maxwell, driven by W. H. Turner, of New York, known to motorists as "Wild Bill" Turner. And Turner's daring way of taking sharp turns at a high rate of speed gave the crowd an extra thrill when the car skidded at a rather dangerous point about half way up the course and one of the rear wheels was seen hanging for a moment over a 1,500-foot precipice.

The next six places were closely contested, with the following records: Second, William Thornley, Chevrolet car, 14 minutes 33 2-5 seconds; third, Bert Clark, Ford machine, 14 minutes, 46 2-5 seconds; fourth, Frank Nelson, Metz friction-drive, 15 minutes 2 1-5 seconds; fifth, E. H. Ball, Franklin car, 17 minutes 31 1-5 seconds; sixth, Frank Greenlee, in a Hupmobile, 17 minutes 42 4-5 seconds; seventh, J. A. Landing, in a Case, 17 minutes 45 2-5 seconds. There were thirteen entries.

The contest was conducted under the sanction and auspices of the American Automobile Association, and will be made an annual event, open to drivers from all parts of the world. An elegant silver cup, the Mount Falcon Trophy, has been established as the first prize.



Oakland agents all over the country are pushing a novel advertising scheme. The Lincoln Highway emblem, consisting of the red, white and blue horizontal-barred poster with a big L in the middle, has been altered by using the L for the middle letter in the word Oakland. These posters are to be put up all over the country, the Lincoln Highway especially being lined with them. The New York agent of the Oakland, the Sidney B. Bowman Automobile Co., 1600 Broadway, states that the poster design has been patented, so that it will be safe from infringement

Testimonial Dinner to Road Men

NEW YORK CITY, Oct. 11—The Manhattan Automobile Club tonight tendered a testimonial dinner to Hon. Morris E. Connolly, President of the Borough of Queens, and Hon. Howland Leavitt, Highway Commissioner of Queens, because of the excellent work they have done in improving the highways of this division of Long Island during the past year.

Quakers To Have Economy Run

PHILADELPHIA, PA., Oct. 11—Entry blanks have been issued by the Quaker City Motor Club for a gasoline economy run to be conducted by that organization on Friday and Saturday, November 7 and 8, to Wilkes-Barre, Pa. Sanction of the A. A. A. has been secured for holding the event and it has also been endorsed by the Philadelphia Automobile Trade Association.

The run will be conducted under the following conditions:

Winner will be the car finishing with the lowest percentage of consumption of gasoline, to be determined by dividing the total quantity of fuel consumed in ounces (128 ounces to the gallon) by the combined weight of the car and its passengers in pounds. No restriction is placed on the kind or grade of fuel. Attached air or fuel carburetor controls are allowed, provided such controls permit of ready operation by the driver from his seat.

All self-starters and primers must be disconnected. Start will be made at 8 a. m. from the Quaker City Motor Club's headquarters, Hotel Walton, where all cars will report, with filled tanks, and where they will be inspected and filled to capacity by the Technical Committee. At the conclusion of the first day's run the tanks will be filled under the supervision of the Technical Committee, and at the end of the run the tanks will again be filled and the quantity of fuel used determined.

Mudlarks Dine and Organize

NEW YORK CITY, Oct. 9—The decennial celebration of the Mudlarks, those who took part in the New York-Pittsburg Reliability Run in 1903, was held at Holley Arms, at Hewlett, L. I., today, the reunion taking the form of a dinner at which pictures were shown on a screen depicting the incidents of that pioneer contest and stories related regarding it. Upwards of 35 attended, of whom approximately a score were genuine Mudlarks, having at least made all of a portion of the run.

A permanent organization was effected and the following officers elected: President, R. H. Johnston, New York; Vice President, Louis R. Smith, New Rochelle; Treasurer, M. L. Downs, New York; Secretary, F. Ed. Spooner, Detroit. President Johnston was expected to appoint five directors to be selected from Mudlarks resident in the leading manufacturing centers and these, together with the officers, will have in charge the work of planning and carrying out future reunions.

The Engineering Digest—Data of Aviation Motors

(*Continued from page 718.*)

example by passing through the crankchamber) and adjustable provisions are added for heating the mixture from the cooling-water, according to the needs. The motors all had large gas conduits, the induction pipes being simple, light and short, but, in contrast with those of automobile motors, of uneven length, which is admissible since the motors work mostly at full load. Those portions of the conduits which are exposed to the current from the airscrew must be covered to obviate precipitation of the gasoline in the cold places. The effect of such provisions and of the heating of carbureters and air is easily demonstrated through the changes which occur in the color of the exhaust.

Peculiarities of the Oiling Systems

Lubrication in an aviation motor serves not only to reduce friction and absorb heat from the usually highly loaded bearing surfaces but also to cool the piston head. Most of the oil goes to waste. It penetrates to the combustion chamber and fouls spark plugs and valves. This can be avoided to a certain extent by deflectors at the cylinder ends as indicated in Fig. 5, and by force-feed to the piston pin (Figs. 5 and 6). **Much oil escapes in the form of a mist through the breather tubes of the crankchamber. If these are made long and are exposed to an air current, the mist can be precipitated on their inside walls,** and it is practicable to use this precipitation for the oiling of remote spots such as the bearings of a camshaft arranged above the cylinders, instead of using oilcups for these places. The joints in the crankchamber at which considerable oil is frequently wasted are those between the tappet rods and their guides. It is therefore best to make their diameter, at the point where oil can exude, as small as possible, as instanced in one of the motors. In another motor, the Mulag, the guides were inclosed within the breather pipes, and these carry the wasted oil back to the crankchamber.

(*To be Continued.*)

GENERAL Motors' Foundry—The General Motors Co., Flint, Mich., is preparing to establish a large foundry at Owosso, Mich.

Moore Truck Will Move Factory—The L. F. Moore Truck Co., manufacturer of commercial vehicles, is moving its factory to Torrange, Cal.

Wagenthals Motor Co. Will Build—The Wagenthals Motor Co., Detroit, Mich., has reorganized, increasing its capital stock from $100,000 to $500,000 and is planning the acquisition of a new and larger plant.

Ford Plans Detroit Plant—Plans were on file at the Builders' Exchange recently for the new six-story factory building for the Ford Motor Co., of Detroit, Mich. It will be built at Buckingham and Cleveland avenues.

I. H. C. Enlarging Plant—In order to meet the demand for its small delivery truck, the International Harvester Co. is erecting at Akron, O., what is said to be the largest plant devoted exclusively to motor truck manufacturing.

White Builds Shop—The White Co., Cleveland, O., has taken a permit for building an additional shop at its plant, East Seventy-ninth street and St. Clair avenue, N. E. The building will be one story high, 30 feet wide by 240 feet long, and will cost about $10,000.

Cadillac's Storage Building—The Cadillac Motor Car Co., Detroit, Mich., has had plans prepared for a large storage building adjoining its plant. The company will considerably increase its output for the coming season and some new machinery will be installed.

Davies-Bach Builds—The Davies-Bach Mfg. Co., Alliance, O., manufacturers of hard-rubber automobile tires, has had plans prepared and will receive bids about February 1 for the erection of a factory. It will be one story, 55 by 206 feet, of brick, hollow tile and reinforced-concrete construction.

Ten Broeck Plant Busy—The Ten Broeck Tyre Co., Louisville, Ky., which was organized about the first of the year with a capital of $250,000 paid in, is now operating a plant at Twenty-sixth and Courtney streets, and puts out three types of pneumatics for automobiles, also a motorcycle tire, with considerable success.

Louisville Plant Not Permanent—The Crown Motor Car Co., Louisville, Ky., which manufactures a light car selling at $400, has not yet decided whether Louisville will be its permanent home or not, it being quite possible that the plant will be located in some one of the manufacturing cities of Indiana, although no decision has yet been made.

Jeffery-De Witt Adds—The Jeffery-De Witt Co. has been reincorporated under Maine laws for $500,000, with all new stock subscribed for by the present stockholders and with the additional capital an addition is to be made to the Detroit, Mich., factory. It will be 53 by 200 feet in size and three stories in height, of the latest and most modern construction throughout.

J. M. Studebaker, Sr., Honored—On October 10 J. M. Studebaker, Sr., pioneer manufacturer, the only surviving one of the five Studebaker brothers, who founded the Studebaker Corp. in South Bend, Ind., was eighty years old. On the afternoon of that day many citizens gathered at the administration building of the company to pay their respects to the veteran manufacturer.

The Automobile Calendar

Shows, Conventions, Etc.

Oct. 6-18	St. Louis, Mo., Automobile Show.
Oct. 18-Nov. 2	Dallas, Tex., Automobile Show.
Oct. 21-24	Wichita, Kan., Trans-Mississippi Commercial Congress.
Oct. 25	New York City, Electrical Exposition Motor Show, Grand Central Palace.
Oct. 27-28	Chicago, Ill., Fourth Annual Convention, Electric Vehicle Assn. of America.
Nov. 8-15	Atlanta, Ga., Show, Atlanta Automobile & Accessory Assn.
Dec. 9-10-11-12	Philadelphia, Pa., Fourth American Road Congress, First Regiment Armory.
Dec. 9-12	Philadelphia, Pa., Annual Convention of American Road Builders' Association.
Dec. 11-20	New York City, First International Exposition of Safety and Sanitation, under the auspices of the American Museum of Safety.
Jan 2-10, 1914	New York City, Importers' Automobile Show, Hotel Astor.
Jan. 3-10, 1914	New York City, Automobile Show, Grand Central Palace.
Jan. 10-16	Milwaukee, Wis., Sixth Annual Show, Auditorium, Milwaukee Automobile Dealers' Assn.
Jan. 24-31, 1914	Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 26-31, 1914	Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.
Jan. 31-Feb. 7, 1914	Minneapolis, Minn., Automobile Show.
Feb. 2-7	Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb. 21-28	Newark, N. J., Automobile Show, N. J., Auto Trade Assn.
Feb. 22-27	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Feb. 22-March 5	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Mar. 7-14	Boston, Mass., Automobile Show.
Mar. 9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
March 17-21	Boston, Mass., Truck Show.

Race Meets, Runs, Hill Climbs, Etc.

Nov. 3	Los Angeles, Cal., Road Race to Phoenix, Ariz.
Nov. 6	Phoenix, Ariz., Track Meeting, State Fair.

Foreign

Oct. 17-28	Paris, France, Automobile Show, Grand Palais, 10 days.
Nov. 7-15	London, Eng., Annual Automobile Exhibition, Olympia.

Drawback on Transmissions—Under an order issued by the secretary of the treasury the department's regulations of August 19, 1913, providing for the payment of drawback on motor cars manufactured by the Keeton Motor Co., Detroit, Mich., with the use of imported ball bearings, have been extended to cover transmissions and rear axles for such motor cars manufactured by said company with the use of imported ball bearings.

Will Manufacture Windshields—The Donegan Auto Body & Specialty Co. has secured the top floor of the Ashwell Garage, Hartford, Conn., and will conduct a general repair business. W. R. Donegan, for a number of years foreman of the trimming department at the Pope company, is president, J. J. Walsh is vice-president and Leon R. Risely secretary and treasurer. The company will manufacture windshields, tops and slip covers in addition to painting and repairing.

Drawback on Self-Starters—The Treasury Department at Washington, D. C., has issued an order instructing the collector of customs at Buffalo, N. Y., to allow, under section 25 of the tariff act of 1909, on self-starting motor car engines, manufactured by the United States Light & Heating Co., of Niagara Falls, with the use of imported motor car gasoline engines and domestic electric motor generators, a drawback of duties on such imported engines. The drawback allowance shall not exceed one imported engine to each self-starting engine exported.

Packard Factory Doings—Automobile outings for the foremen and their assistants are being held each week at the factory of the Packard Motor Car Co., Detroit, Mich. A postgraduate course for Packard technical men has been installed in the truck factory in order to develop experts thoroughly familiar with every detail of construction and operation of heavy duty vehicles. The sales school was attended by sixteen salesmen this week. The men were sent by the Packard dealers in various parts of the country. Talks on salesmanship, technical lectures, discussions and inspection trips through the plant made up the program.

Truck Concern Wants Warren Site—Warren, O., is a position to welcome to its midst another manufacturing concern, the product of which is motor trucks. C. W. Moody, who owns a controlling interest in the Standard Motor Truck Co., of Cleveland, O., is desirous of locating in that city. His lease on the Cleveland property expires on the first of November, and he is anxious to locate in Warren. The company is at present capitalized at about $20,000, and Mr. Moody would like to sell $10,000 of stock to Warren men. If he is able to do that, and can secure a desirable factory site there, the plant will be brought to the latter city. The company employs at present about 25 people.

The Week in the Industry

Motor Men in New Roles

ROBINS Resigns from Ames Co.—Harry M. Robins has severed his connection as sales manager of the Ames Motor Car Co., Owensboro, Ky. He will probably enter the parts manufacturing field somewhere in the Detroit district.

Griffin Advertising—J. G. Griffin has recently joined the Greer-Robbins Motor Co. of Los Angeles, Cal., as advertising manager.

Bland Detroit Jackson Manager—E. F. Bland has become manager of the Detroit, Mich., branch of the Jackson Automobile Co., Jackson, Mich.

Gutchess Manager Empire Top Plant—H. E. Gutchess has joined the Empire Auto Top Co., Philadelphia, Pa. He will manage the entire plant.

McCormick Philadelphia Chalmers Manager—Robert McCormick has been made sales manager of the Philadelphia, Pa., organization of the Chalmers Motor Co.

Brandes Manages Export Trade—C. O. Brandes has been appointed manager of the new export sales and shipping department of the Firestone Tire & Rubber Co., Akron, O.

Williams Gibson Sales Manager—H. R. Williams, formerly of Pittsburgh, Pa., has been made sales manager of the accessories department of the Gibson Automobile Co., Indianapolis.

Wilson Succeeds Copeland—J. T. Wilson has been appointed purchasing agent for the Buick Motor Co., Flint, Mich., succeeding E. J. Copeland, who resigned to go to the Corcoran Lamp Co.

Jordan Succeeds Field—E. S. Jordan, advertising manager of the Thomas B. Jeffery Co., Kenosha, Wis., has been appointed sales manager, a post that has been occupied by Harry E. Field.

C. W. Wright New Manager—C. W. Wright has been appointed general manager of the Colonial Motor Co., Baltimore, Md., Maryland representative for Studebaker car and Universal truck.

Dougherty in New Field—George H. Dougherty, advertising manager of the Michigan Motor Car Co., Kalamazoo, Mich., has become associated with the Taylor-Critchfield advertising agency in Chicago, Ill.

Beer with Franklin—Chas. M Beer, who for 12 years was advertising manager for Drs. Hess and Clark of Ashland, O., is now connected with the publicity department of the Franklin Automobile Co., Syracuse, N. Y.

Magee Arizona U. S. Tire Manager—J. B. Magee, who has had charge of United States Tire Co. advertising and publicity in the western district, has been promoted to the position of resident manager in Phoenix, Ariz.

Seiberling Off to Coast—A. G. Sieberling recently left the Haynes factory at Kokomo, Ind., in a Haynes car and went as far as Chicago, where he embarked upon a train to the Pacific coast. He will visit the leading cities.

Dayton Goes with Ajax-Grieb—Fred E. Dayton has joined the forces of the Ajax-Grieb Rubber Co. He will become assistant to J. C. Matlack who has charge of sales, and also will manage the advertising of Ajax tires and other products.

Chase With Lyons-Atlas—E. H. Chase, Jr., formerly general sales and business manager of the branch of the Olds Motor Works at Louisville, Ky., has joined the staff of the Lyons-Atlas Co., Indianapolis, Ind. He will be assistant sales manager.

Vail Goes to Waltham Watch—E. L. Vail, who for a number of years was associated with C. F. Splitdorf, and who recently has been sales manager of the Hoffecker Speedometer Co., has joined the staff of the Waltham Watch Co., Waltham, Mass.

Leeman New Sales Manager—Ray Leeman, formerly advertising manager of the Henderson Motor Car Co., Indianapolis, Ind., has been appointed sales and advertising manager of the Tri-State Sales Co., Dallas, Tex., state distributors for the Marathon.

Lazelle Sales Manager—W. E. Lazelle has been appointed sales manager for Eastern Ontario for the Maritime Motor Car Co., St. John, N. B., manufacturing in Canada the Maritime Singer, and has opened a service station and Showrooms at 477-477½ Yonge street.

Meyers Motor Traffic Expert—C. T. Meyers has opened offices in Detroit, Mich., as a motor traffic expert, offering advisory service to owners and prospective owners of motor trucks. He was formerly with the General Motors Co., at New York City, and with the Rapid Motor Vehicle Co., at Pontiac, Mich.

Garage and Dealers' Field

Repair Shop Moves—The Byrd Automobile Repair Co. has moved from 1525 Bedford avenue, Brooklyn, N. Y., to 1001-1003 Bedford avenue.

Takes Interlock Agency—The Franklin Rubber Co., 265 North Fourth street, Columbus, O., has taken the central Ohio agency for the Interlock inner tube.

Plugit Agency Moves—Maurice V. Heathcote, agent for the Plugit liquid tire filler, has moved from 2 West Preston street to 1823 Maryland avenue, Baltimore, Md.

Take Boyce Motormeter Agency—C. M. Lanahan and L. B. Platt have taken the agency in Baltimore, Md., for the Boyce Motormeter with showrooms at 1924 North Charles street.

Service Recorder in Indianapolis—The Service Recorder Co., manufacturing a device for recording the movement of motor vehicles when in service, thus detecting whether or not any time has been lost, has opened a factory sales branch in the Lemcke Annex, Indianapolis, Ind., with Roy Crull as manager.

Los Angeles Purchases Seven Fords—The city of Los Angeles, Cal., has just purchased a carload of seven Ford machines, which have been put in service by the various municipal departments.

Moves to Larger Quarters—The American Motor Equipment Co., 27 Haverhill street, will shortly move to more spacious quarters at 69-73 Washington street, Boston, Mass., where it will be much better equipped.

Overland Agent Moves—Ed. H. Harris, Overland agent formerly located at 107 Albany avenue, Hartford, Conn., has secured quarters at 244 Pearl street. As soon as alterations are complete a salesroom will be located at the latter address.

Will Handle Accessories—The Reus Bros. Co., Baltimore, Md., has been formed to handle the G. and J. tires, the R. I. V. ball bearings to be agents for the Stewart-Warner Autometer Co. and to conduct a Bosch magneto service station and laboratory. The firm is composed of Burkhard Reus, John F. Reus, Jr., and S. Wilson Morrow, all formerly of Carl Spoerer's Sons Co., and is erecting a new building at Mt. Royal avenue and Cathedral street.

Stromberg's N. Y. Branch Moves—The Stromberg Motor Devices Co., maker of the Stromberg carbureter announces the removal of its Eastern branch to 146 West Fifty-sixth street, New York City. The branch occupies a three-story building, the ground floor of which is devoted to service and installation work. The second story is occupied with an extensive stock room and sales room, while the third story is taken up with offices. This branch, of which R. B. Whitman is the manager, is the center of Stromberg activities for all of the Atlantic Coast states.

Changes in Cleveland Automobile Row—Several important changes took place along the Cleveland, O., automobile row in the week just ended. The Neighbors Motor Co., Hupmobile distributors in this territory, is now located in the former Oldsmobile quarters at 2108 Euclid avenue. The Ohio-Buick Co. has moved into its new quarters at 1730 Euclid avenue, leased from the W. H. Barger Co., local Rambler and Fiat agent. The Barger Co. has secured temporary space at 5017 Euclid avenue pending its return to the present Cadillac location at 1628 Euclid avenue. The Lozier Sales Co., 2336 Euclid avenue announces discontinuance of the Lozier line, and that it will concentrate on the Chandler light weight six. The Peerless Motor Car Co. has discontinued, for the winter, its rebuilt car salesrooms at 1710 Euclid avenue, this part of the business being handled now at the factory. The Empire Tire Co. has changed its Cleveland agency to the Lockwood-Luetkemeyer-Henry Co., Superior avenue, N. W.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BRIDGEPORT, CONN.—Aurora Vulcan Co.; capital, $250,000; to manufacture automobiles. Incorporators: S. Sherwood Day, H. N. Billings, R. K. Hall.

CHICAGO, ILL.—Universal Auto Supply Mfg. Co.; capital, $50,000; to deal in automobiles. Incorporators: C. S. Tuttle, G. Burke, J. D. Iroz.

CLEVELAND, O.—National Motor Supply Co.; capital, $35,000; to manufacture and deal in automobile motors. Incorporators: V. H. Meyer, H. G. Schowe, F. E. Abbott, E. E. Gargett, F. D. Denith.

DARINGTON, S. C.—Cask Automobile Co.; capital, $1,000; to deal in automobiles. Incorporators: C. C. Vaughn, B. B. Brassington.

DETROIT, MICH.—Hawk Motor Car Co.; capital, $50,000; to manufacture cyclecars. Incorporators, F. S. Salter, Duane Tibbitts, W. W. McIntyre.

DOVER, DEL.—Standard Motor Co.; capital, $6,000,000; to sell and deal in automobiles. Incorporators: F. E. Kenaston, S. H. Bowman, P. M. Starnes, M. J. Scanlon, F. E. Starnes, C. H. Nider, W. M. Colby, S. J. Boal.

FORT WORTH, TEX.—A. P. Mitchell Auto Co.; capital, $15,000; to deal in automobiles. Incorporators: F. L. Toepperwin, J. R. Walker, H. Roos.

FRANKFORT, KY.—Frankfort Motor Car Co.; capital, $3,000; to deal in automobiles. Incorporators: T. P. Rogers, J. O. Rogers, O. C. Kenney, J. E. Manford, A. L. Manford, A. L. Bacon.

HARTFORD, CONN.—J. J. Roach Co.; capital, $50,000; general garage business. Incorporators: C. F. Roach, J. J. Roach, H. W. Nuckols.

MONTREAL, QUE.—Major Automobile, Ltd.; capital, $50,000; to deal in automobiles. Incorporators: G. A. Major, Alexis Frappier.

MORRISTOWN, N. J.—Morristown Automobile School; capital, $125,000; general automobile business. Incorporators: J. O'Gorman, J. J. Luons, T. E. Lowe.

NEW YORK CITY—Brockway Motor Truck Sales Corp. of Manhattan; capital, $15,000; to deal in motor trucks. Incorporators: W. N. Brockway, J. F. Soby, R. S. Sack.

NEW ORLEANS, LA.—Burns Automobile Exchange; capital, $10,000; to deal in automobiles. Incorporators: W. H. Byrnes, Helen McGrath, W. T. Burns.

NEW YORK CITY—Motor Materials Co.; capital, $100,000; to manufacture, sell and deal in and with motor engines operated by gas or electricity.

ST. LOUIS, MO.—Bond Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: M. W. Bond, Caroline Bond, Charles Kist.

GARAGES AND ACCESSORIES

BOSTON, MASS.—Endurance Tire & Rubber Co.; capital, $3,000; to deal in tires. Incorporators: J. H. Cooper, J. L. Hamilton.

BOSTON, MASS.—Harding Specialties Mfg. Co.; capital, $50,000; to manufacture and deal in automobile supplies. Incorporators: W. W. Harding, T. J. Graham, H. W. Sprague.

BOSTON, MASS.—Jamaica Plain Express & Garage Co.; capital, $10,000, general garage business. Incorporators: C. C. Lervey, Martin C. Flynn, L. P. Atwood.

BOSTON, MASS.—Roch Oil Motor Co.; capital, $50,000; to deal in automobile oils. Incorporators: W. W. Potter, C. M. Ludden, A. M. McLean.

BROOKLYN, N. Y.—Brooklyn Broadway Garage, Inc.; capital, $5,000; to operate a garage. Incorporators: W. C. Baur, Otto Clausner, Jacob Schmitt.

BUCYRUS, O.—Berk Mfg. Co.; capital, $1,000; to deal in automobile accessories. Incorporators: E. P. Berk, Dora Berk, J. S. Berk, H. Berk, A. H. Berk.

BUFFALO, N. Y.—Star Motor Delivery Co.; capital, $20,000; trucking and delivery business. Incorporators: J. B. Corcoran, W. H. Corcoran, R. H. Conner.

CAMBRIDGE, MASS.—Cambridge Garage Co.; capital, $5,000; general garage business. Incorporators: H. Peabody Farnham, W. C. Ford, E. D. Farnham.

CLARKSBURG, W. VA.—Thompson Garage Co.; capital, $10,000; general garage business. Incorporators: D. Scott, Austin Myers, Ethel Myers, F. S. Thompson, J. C. Biddle.

CLEVELAND, O.—Buckeye Motor Trucking Co.; capital, $1,000; to do a general trucking business. Incorporators: H. F. Kulas, F. E. Kulas, Frank Kulas, E. Powell.

CLEVELAND, O.—Cleveland Motor Lamp & Radiator Co.; capital, $10,000; to manufacture automobile lamps and radiators. Incorporators: W. H. Montie, J. L. Ballash, E. E. Keisler and others.

DALLAS, TEX.—New York Tire Filler Co.; capital, $20,000; to deal in tires. Incorporator: H. E. Prather.

DETROIT, MICH.—Standard Fender Co.; capital, $250,000; to manufacture fenders and other metal articles.

DOVER, DEL.—L. & B. Grease Co.; capital, $100,000; to manufacture automobile grease. Incorporators: E. F. Burrow, J. A. Lewis, M. G. Ryan.

DOVER, DEL.—Spring Cushion Tire Co.; capital, $300,000; to manufacture a new style of spring tire. Incorporators: W. Lofland, J. S. Collins.

LOS ANGELES, CAL.—Panama Rubber Co.; capital, $1,000,000; to manufacture automobile tires. Incorporators: W. D. Newerf, J. J. Harsman, W. E. McCune, H. C. Griffing, J. R. Roe.

LOWELL, MASS.—Lowell Road Garage Co.; capital, $1,200; general garage business. Incorporators: S. A. Macone, J. C. Macone, J. A. Macone.

MONTREAL, QUE.—Automobile Trade Assn., Ltd.; capital, $10,000; general club in the interests of automobiles and good roads. Incorporators: W. L. Stoneburn, Wm. A. Allen, W. P. Kearney, P. R. Hanson, George Husson, Victor Levesque, Wm. Sinkinger.

NEW YORK CITY—C. & P. Kerosene Carburetor Co.; capital, $100,000; to deal in automobile accessories. Incorporators: L. F. Belletier, E. F. Ciglia, Hilding Anderson.

NEW YORK CITY—Taxicab Assn.; capital, $10,000; taxicab business. Incorporators: L. H. Biglow, Jr., A. L. Loomis, Aksel Wichfield.

NEW YORK CITY.—Warm Hand Steering Wheel Corp.; capital, $150,000; to manufacture steering wheels for automobiles. Incorporators: G. E. Smith, W. S. Barton, J. C. Barton.

NEW YORK CITY—Yorkville Auto Supply Co.; capital, $10,000; to manufacture automobile tires, rubber goods, automobile supplies and deal in same. Incorporators: Sydney Richman, William Yates, A. E. Stacy.

PADUCAH, KY.—Red Diamond Auto Line; capital, $500; to engage in automobile bus line business. Incorporators: M. R. Cherry, R. Steiner, N. B. Anderson, O. L. Harten.

PHILADELPHIA, PA.—Quality Rubber & Auto Supply Co.; capital, $25,000; to manufacture, sell and deal in automobile tires.

PITTSBURGH, PA.—Spring Cushion Tire Corp.; capital, $300,000; to manufacture cushion tires for automobiles. Incorporators: W. I. N. Lofland, J. S. Collins, Jr., W. F. P. Lofland.

RICHMOND, N. Y.—Richmond Auto Polo Club; capital, $2,000; to promote automobile polo. Incorporators: John Milnes, C. B. Dullea, M. H. Hanson.

YONKERS, N. Y.—Colonial Garage Co.; capital, $10,000; to operate a garage and livery service. Incorporators: G. H. Mills, F. S. Jones, Charles Smith.

CHANGES OF NAME AND CAPITAL

BUFFALO, N. Y.—Mutual Motor Car Co.; capital reduced from $50,000 to $5,000.

DETROIT, MICH.—Wagenthals Motor Co.; capital increased from $100,000 to $500,000.

RACINE, WIS.—Harvey Spring Co.; capital increased from $15,000 to $300,000.

New Agencies Established During the Week

PASSENGER VEHICLES

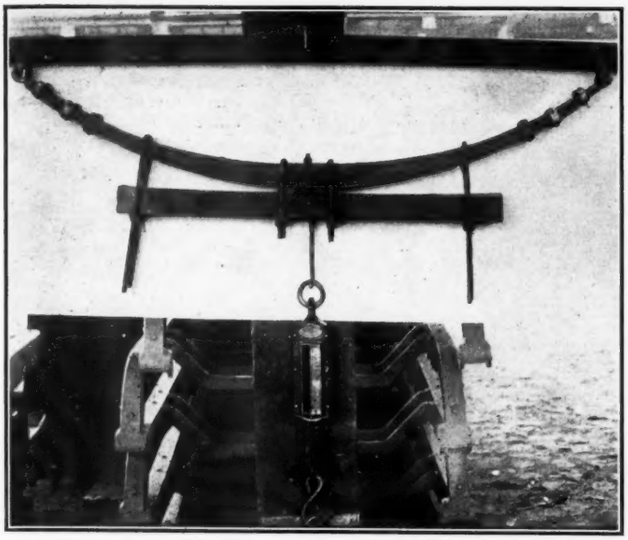
Place	Car	Agent
Aberdeen, S. D.	Studebaker	W. C. Nissen.
Akron, O.	Franklin	Akron Auto Garage Co.
Akron, O.	Overland	Akron Auto Garage Co.
Akron, O.	Studebaker	West Hill Garage.
Akron, O.	Thomas	Akron Auto Garage Co.
Akron, O.	Velie	H. F. M. Garage.
Akron, O.	White	West Hill Garage.
Alpena, Mich.	Oakland	C. A. Reynolds.
Baltimore, Md.	Marion	American Motors Co.
Baltimore, Md.	Metz	Milton Avenue Garage.
Baltimore, Md.	Oakland	Oakland Motor Co.
Bay City, Mich.	Oakland	Oakland Auto Co.
Belding, Mich.	Oakland	Chas. Murray.
Beverly, Mass.	Oldsmobile	J. Elmer Wood
Camp Grove, Ill.	Oakland	E. N. Bogner.
Cascade, Ia.	Oakland	Cascade Auto & Supply Co.
Columbus, O.	Chevrolet	Hallock Motor Co.
Dallas, Tex.	Marathon	Tri-State Sales Co.
Davenport, Ia.	Oakland	Thomas Auto Co.
Denver, Colo.	Franklin	E. H. Bull.
Detroit, Mich.	Lozier	Wetmore-Quinn Co.
Findlay, O.	Buick	W. E. Van Eman.
Jacksonville, Fla.	Oldsmobile	Merril-Stevens Co.
Jacksonville, Ill.	Oakland	D. Estaque.
Kansas City, Mo.	Oldsmobile	Bond Motor Co.
Lansdale, Pa.	Oldsmobile	Heebner-Feiver Motor Car Co.
Lansing, Mich.	Oakland	Robson Auto Sales Co.
Lansing, Mich.	Oldsmobile	Union Garage.
Lapeer, Mich.	Oakland	C. England.
Ludington, Mich.	Oakland	Howard Smith.
Maquon, Ill.	Oakland	Max Barash.
Milwaukee, Wis.	Premier	Hustis Bros.
Milwaukee, Wis.	Regal	Retail Auto Sales Co.
Mishawaka, Ind.	Oakland	Guy Stutzman & D. J. Smith.
Montreal, Que.	Cole	Rousseau Bros.
Montreal, Que.	McFarlan	Fournier & Rodier.
Montreal, Que.	Pullman	E. N. Hebert.
Montreal, Que.	Stutz	G. O. Desy.
New York City.	Havers	K. C. Pardee, Inc.
Paris, Ill.	Oakland	O'Hair's Garage.
Pesotum, Ill.	Oakland	Dunn & Gilles.
Philadelphia, Pa.	Moon	Minerva Motors Co.
Pontiac, Ill.	Oakland	Bane & Schrock.
Port Arthur, Ont.	Oakland	W. J. Fisher.
Port Huron, Mich.	Oakland	Mooney Motor Sales Co.
Portland, Ore.	Lozier	Northwest Auto Co.
Portland, Ore.	Oakland	Gerlinger Motor Car Co.
Portland, Ore.	Stevens-Duryea	Pacific Motors Co.
Rocky Mount, N. C.	Oakland	W. E. Fenner Auto Co.
Salisbury, Md.	Oakland	Peninsula Motor Co.
Sault Ste. Marie, Mich.	Oakland	Lock City Auto Co.
San Francisco, Cal.	Franklin	J. F. McLain.
Sandusky, Mich.	Oakland	A. W. McNinch.
Schenectady, N. Y.	Oakland	H. W. Chubb.
Seattle, Wash.	Maxwell	Seattle Automobile Co.
Seattle, Wash.	Oakland	R. W. Abbott Motor Car Co.
Shamokin, Pa.	Oldsmobile	Edgewood Garage
St. Catharines, Ont.	Oakland	International Garage.
St. Johns, Mich.	Oakland	S. N. Shaffer.
Sterling, Ill.	Oldsmobile	George D. Greenough
Tipton, Ia.	Oakland	Tipton Carriage & Auto Co.
Traverse City, Mich.	Oakland	J. C. Morgan & Sons.
Troy, N. Y.	Haynes	Bolton-Meyers Auto & Truck Co.
Vancouver, B. C.	Sheffield-Simplex	Dingwall Cotts & Co.
Vancouver, B. C.	Talbot	Dingwall Cotts & Co.
Vancouver, B. C.	Voiturette	H. J. Tucker.
Warwick, Que.	Oakland	P. R. Baril.
Washington, Pa.	Oakland	H. L. Robinson.
Watertown, N. Y.	Oakland	Watertown Auto & Supply Co.
Worcester, Mass.	Franklin	V. J. Eckberg Co.

ELECTRIC VEHICLES

Hartford, Conn.	Ohio	Electric Auto Station.

COMMERCIAL VEHICLES

Baltimore, Md.	Kelly	Neely & Ensor.
Baltimore, Md.	Willys	Motor Car Co.
Columbus, O.	Federal	Coats Motor Car Co.
Indianapolis, Ind.	Commerce	Sterling Motor Car Co.
Kansas City, Miss.	Commerce	Hall Bros. and Reeves
Little Rock, Ark.	Commerce	Paige-Detroit Auto Co.
Los Angeles, Cal.	Perfex	Bulkley & Co.
Dallas, Tex.	Commerce	Texas Motor Car & Truck Co.
Denver, Col.	Commerce	Fernauld Auto Co.
Ft. Wayne, Ind.	Commerce	Electric Supply & Fixture Co.
Oakland, Cal.	Commerce	R. C. Keil
Philadelphia, Pa.	Commerce	Baker Bell Motor Co.
Pittsburg, Pa.	Commerce	The Klinger Co.
Portland, Ore.	Commerce	R. L. Oakley
Portland, Ore.	Wilcox	Commercial Electric Co.
Providence, R. I.	Commerce	Nock Auto Co.
Rochester, N. Y.	Commerce	Smith's Garage



Device used for determining correct length of check bar

Chapin Device Checks Rebound

"THERE is no control over the riding action through the several inches of deflection caused by supporting the initial load." This is claimed by Henry Chapin to be the greatest defect in automobile springs. His explanation follows in part:

"Referring to Fig. 1, at A we have a spring under no stress, as it lies on the bench. It stands 10 inches high and has a capacity of 200 pounds to the inch, which means that after it has been compressed enough to offer material resistance it will take 200 pounds to deflect it 1 inch farther.

"At B we have the position of this spring after it has been placed on the car and the car equipped and ready for the road, but without occupants. It is standing only 6 inches high, and, having been deflected 4 inches it is supporting a load of 800 pounds, its share of the body load.

"At C the passengers have climbed in. The spring now stands open only 5 inches, so the passengers have added to this spring another 200 pounds and the spring is supporting 1,000 pounds.

"Now comes the trouble, the un-noticed or innocent-looking bump in the road, be it a hummock or the far side of a hollow. Up goes the axle, depressing the spring flat as at D. Instantly the spring imparts its 200 pounds per inch pressure, acting through this 3-inch deflection caused by the road, applying 600 pounds of up-thrust in addition to that already supporting the avoirdupois of 1,000 pounds. The spring is now pushing upward 1,600 pounds against a 1,000-pound weight.

Rebound Makes Discomfort

"Up goes the body. Will it stop when the spring has reached position C? You want it to do at least that, for perhaps the axle has already passed the obstruction, and if the body will only stop at C the lifting will be slight.

"But how can it stop at C? At that point it was in perfect suspension: it weighed nothing. Hence it offers no resistance to this new 600 pounds, also it has attained an upward inertia, counteracting gravity for the moment, **and the spring has 5 inches more in which to push at 200 pounds to the inch.**

"Uncontrolled 5 inches! Needless 1,000 pounds of up-thrust that you do not want just now! The spring tries to go right on through to A, until gravity reasserts itself over the upward inertia, imparted by the road obstruction, communicated by that 1,600 pounds pressure, and continued by that useless 1,000 pounds pressure above the desired stopping point. Can we rob it of this action without injuring its initial-load-bearing function? Can we produce a spring that will support the initial load **without deflection?**

"**That is the defect in springs—that 1,000 pounds of up-lift** where it isn't wanted, effective as long as upward body inertia exceeds or nearly equals gravity, constantly **adding** its force to the undesired rebound.

"But why rebound at all? The perfect spring should only absorb the shock. Here we have it really communicating a reaction greater than its prime or absorbent action—going up 5 inches more above C, or 8 inches altogether, because of a compression from the road of only 3 inches below the position C.

"And now, with the body and load momentarily high in air, we face another, the other great spring problem: It must all descend, and the springs must support it.

"Long tests were conducted, dozens of records made, measured and compared. Indicator cards were taken of different cars, of different sizes and with different types of springs. Full loads and light loads, general road and prepared obstructions, hummocks and hollows; 10 miles per hour, 15, 20 and higher, all were tried, recorded, measured, then weighed and figured out by the known scale weights and spring capacities.

"And it all proved one clear point: properly designed unchecked springs under full standard load (whatever the size of the car) have much the same relative strength, have the same relative tossing power (each through its own equivalent of the upper 5 inches in Fig. 1) and the addition to avoirdupois (the 1,000 pounds) by the inertia of the resulting drop, is almost uniformly 75 per cent. maximum (750 pounds more).

Bumps on the Drop

"Having established the inertia overload, return to the Fig. 1 explanation. We left the body, high in air, about to descend with a total load of, not the 1,000 pounds it started with, but 1,750 pounds—and the spring must meet it.

"The initial thousand carries it down to position C where we wish it would stop, but it can't; the extra 750 pounds is resisted only at 200 pounds to the inch, it must go on down until absorbed—200 into 750—indicating over 3.5 inches farther! or, but for friction between the leaves, lower than position D. This is when it bumps, especially if the axle rises again.

"So we made a bar as in Fig. 2. We made it rigid. We put it at B because B is a constant, to which position the car returns every time it is empty, whereas C varies with different loads. Clamped against the spring the bar holds it fast at B.

"Add the body and there is no stress on the bar, the body balances the stress. Add the passengers and the spring moves to or about C, freeing it from contact with the ends of the bar, leaving the spring untrammelled for its work.

"Rebound now stops at B for the same three reasons that it previously stopped at A. **The spring is spent** at B. Gravity reasserts itself at B. The anchor of the axle is applied at B.

"This definite checking, definitely reduces the 1,750 pounds load mentioned to less than 1,450 pounds maximum load, causing over one-seventh less stress on the spring.

"Having disposed of the defect, what of the imperfect application of springs due to the defect? Further tests proved that they can be made one-seventh lower capacity and easier riding when this device is used, yet be stronger for their work.

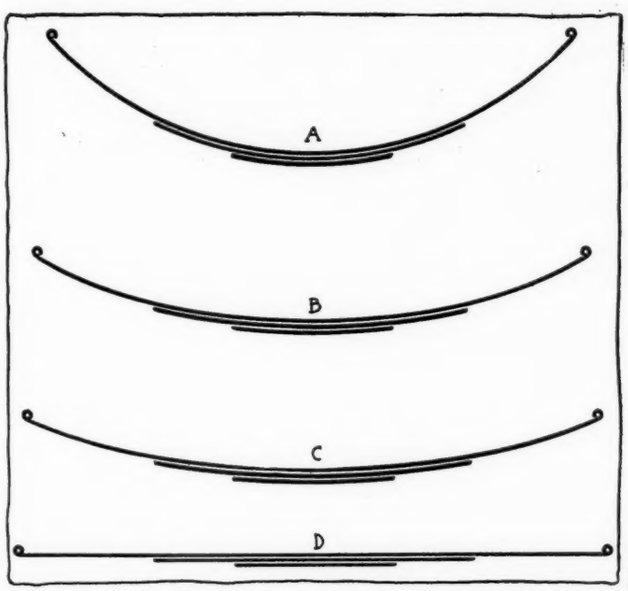


Fig. 1—Position taken by leaf spring under different stresses

Fig. 2—Normal position of spring with check bar in place

Accessories for the Automobilist

WELD Extra Jet—An extra jet for easy starting purposes which can be installed by any automobilist has been brought out by the Weld Mfg. Co., North Chatham, Mass. The device can be installed on any carbureter and when starting the motor it furnishes a richly carbureted mixture directly to the upper part of the intake manifold. The gasoline is carried from the bottom part of the float chamber to the manifold through an independent lead and is carbureted on its way into the motor by a device in the line.

The principle of operation is as follows: the gasoline comes in at A, Fig. 1, and passes up (being regulated by the needle valve B) to the openings C, the air comes in at holes D and lifts valve G and passes directly across openings C, vaporizing the gasoline, which is drawn up at the same time by the suction. The way that the air passes the gasoline jets makes it break up the gasoline into a very fine vapor and so make a very easily fired mixture.

After mixing with the gasoline the mixture goes straight up by check valve H and out the top through the copper tubing to the manifold at the highest possible point.

The piston E is shown held open in the operating position against the tension of the spring F, the chain by which it is operated being attached at I.

The name extra jet describes this device very closely. It cannot leak because the gasoline is drawn up to the opening by suction, and instead of simply putting raw gasoline into the intake pipe it delivers a vaporized mixture which will ignite easily. It is in use only at the time of starting and does not affect the carbureter in any way. In many cases there should be considerable economy in its use as the carbureter can be adjusted to a leaner mixture when the question of starting does not enter into it.

There is but one adjustment—the needle valve B. Before applying the extra jet it is well to examine it and see that the needle valve about half closes the gasoline passage; this can be seen by looking up from the bottom before it is attached.

The method of operation is as follows: Throw the dash handle to open position, when it will lock; then, with the throttle closed, crank the motor; it will in most cases start on the third or fourth pull if the spark is good; then unless the weather is cold, release the dash handle which will spring closed. If the motor does not start, open the needle valve about one turn and try again. The needle valve opens by unscrewing it. If, however, the engine starts, and after running a few revolutions stops, it means that the extra jet is giving too much gasoline, and the needle valve should be closed somewhat. After the engine has stopped from too much gasoline, throw off the extra jet and open the throttle slightly, when the engine will start on the first or second pull.

It is sometimes better to open the throttle slightly than to close the needle valve, and on some engines it is better to give two or three pulls slowly, and then to open the throttle partly and give one quick pull.

As a rule in the summer, the needle valve of the extra jet will need less opening than in cold weather.

M. J. L. Rear Adustable Bumper—Fig. 2 shows an illustration of a rear bumper that differs from the conventional type in that it can be attached without drilling the frame, removing shackle bolts or otherwise disturbing the construction of the car. It is made by M. J. LeClerc, New York City. Flat plates, which are clamped to the spring members, hold the guides in which the bumper-rods slide. The latter are fastened to the channel steel bumper by screwing into riveted cast-iron brackets. Adjustment is provided both as to height of bumper and angularity of same with the ground so that it can be easily and satisfactorily fitted to any car. Prices vary from $13 to $15, depending on whether brass, nickel or enamel finish are selected.

Parker Vaporizer—Fig. 3 shows the Parker vaporizer manufactured by the Parker Mfg. Co., Philadelphia, Pa. This vaporizer, A, is particularly designed and adapted for use in connection with the ordinary gasoline engine carbureter, and is installed at the joint in the manifold above the carbureter, as shown in the illustration at B. Gasoline as it is sucked from the nozzle of the carbureter by the vacuum of the engine will hold to the globular form with more or less tenacity, the finer the fuel diffusion the more rapid and complete the vaporization and the greater the homogeneity of the final mixture. It consists of a conical mesh screen, containing a fan which gives the air and gasoline a rotary motion inside this screen, diffusing the gasoline spray and air into a perfect combustible charge for the engine. The maker claims that it will save 25 per cent. on gasoline and will make the engine more flexible and also reduce carbonization.

Webb Jay Primer—Besides the device described above the Automatic Priming Device Co., Chicago, Ill., has improved on the Webb Jay primer brought out some time ago. The new primer, Fig. 4, incorporates a sight feed. That is, the driver is able to see just how much gasoline, if any, is being sent to the cylinders to gain a start. It will be noted there are two pipes A and B within the sight, the upper one connecting with a pipe which taps the gas line, and the lower one which runs to the intake manifold of the motor. In starting the car, especially in cold weather, the handle is

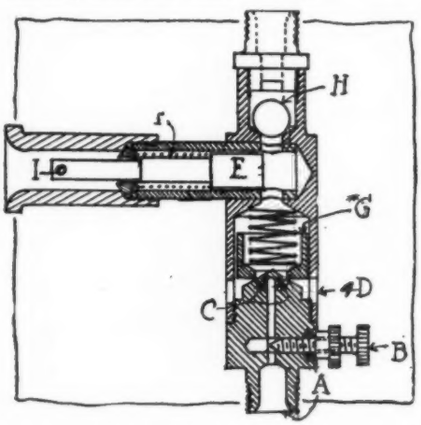


Fig. 1—Weld extra jet for starting

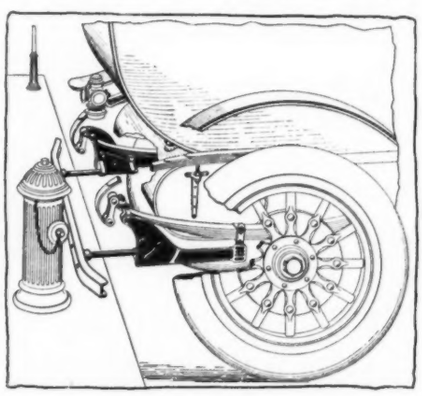


Fig. 2—M. J. L. adjustable bumper

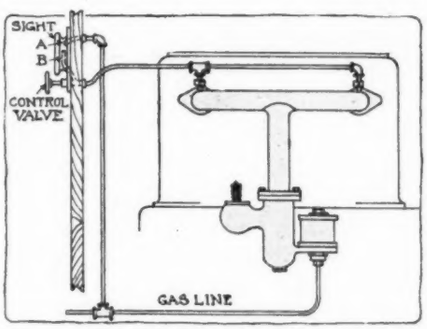


Fig. 4—Webb Jay primer

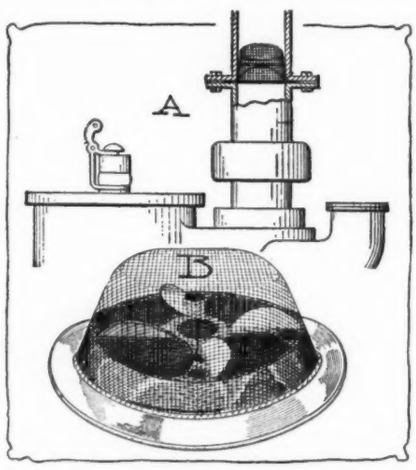
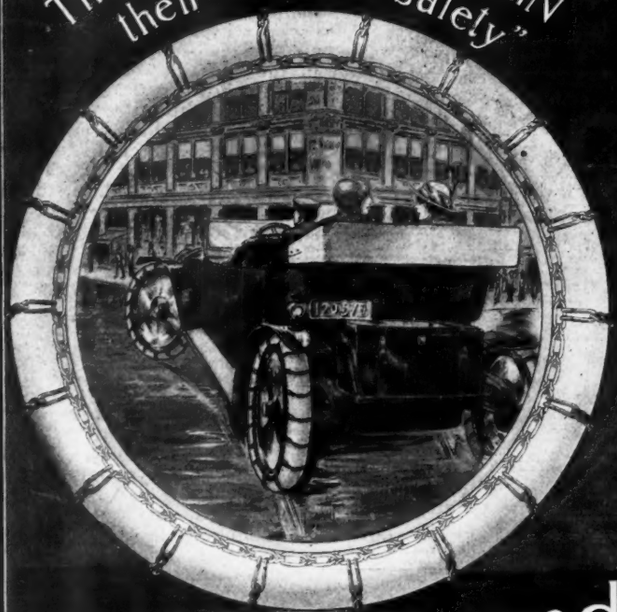


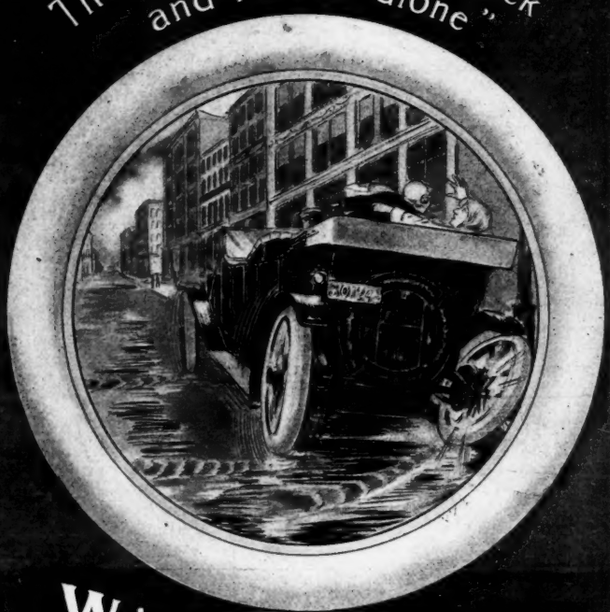
Fig. 3—Parker vaporizer, showing attachment

Motoring Circles — *In Which do You Belong?*

Those who "WEED CHAIN their cars to safety"



Those who "depend on luck and rubber alone"



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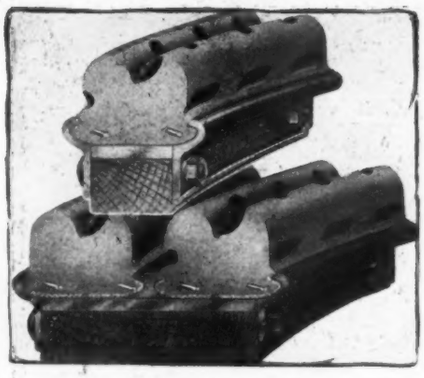

Fig. 5—New Motz truck tire

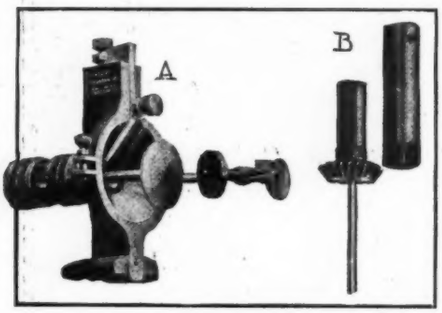

Fig. 6—G. B. valve tool

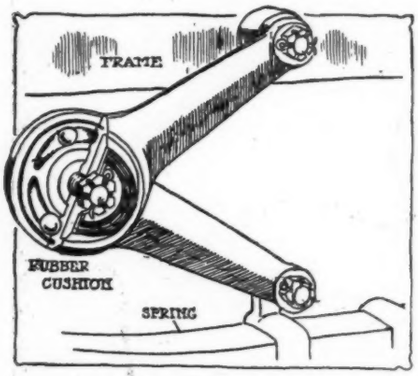

Fig. 7—Ball-bearing shock-absorber

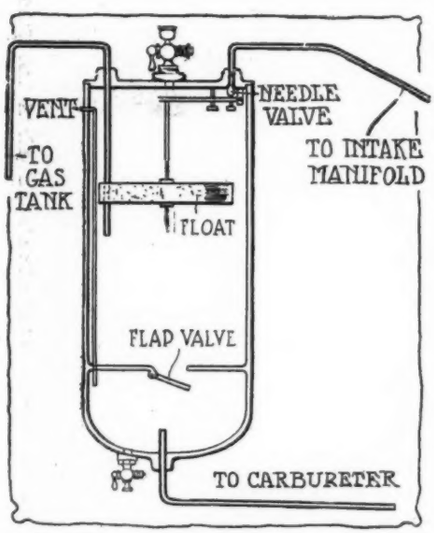

Fig. 8—Webb Jay gravity feed

turned slightly to the right which permits gasoline to flow from the main line into the sight and at the same time a quantity trickles through the small hole in the standpipe B to the intake manifold. When the motor has started more fuel may be fed to the motor through the intake manifold and thus the motor made hot by the rich mixture, in a short time. Even when on the road, should there be necessity for feeding the motor more gasoline, the device affords a convenient means of controlling the fuel, which will flow through the standpipe B when the handle is turned to the right. When stopping the car a turn of the handle shoots a rich mixture into the cylinders and eliminates engine racing.

Motz Truck Tire—The Motz Tire and Rubber Co., Akron, O., has produced a cushion tire, Fig. 5, especially adapted for motor truck operation. Heretofore the company has manufactured cushion tires exclusively for passenger vehicles and delivery wagons, a solid tire of conventional form being made for the heavier commercial cars.

In design this new tire follows the construction of the passenger car type closely, having the characteristic undercut sides and dual tread, which features give it its cushioning effect. It is, however, flatter in cross-section and the non-skid feature is obtained by perpendicular indentations on the inside of each tread instead of by diagonal grooves across their faces.

This tire is made in sizes up to 4 inches and according to S. A. E. specifications. It is guaranteed for 10,000 miles, and against defective material and workmanship for 1 year.

G. B. Valve Tool—A tool for dressing and reseating valve seats without grinding is being marketed by the Auto Supply Co., Broadway and Fifty-ninth street, New York City. This product, called the G. B. Valve tool, Fig. 6, consists in A, of a valve dresser, which is so constructed that it will dress valves of any size or material at a perfect angle of 45 degrees, and a reseating tool, also illustrated at B, which reseats the valve seat quickly and accurately at a perfect angle to meet the exact angle of the valve. The use of this tool will not only remove all carbon deposit, but will dress off all imperfections on valve or seat, such as ridges, grooves, pits, etc. The tool is of drop-forged, case-hardened steel and the blade and seat-cutter of high-speed, oil-tempered tool steel.

Ball Bearing Shock-Absorber—A new shock-absorber has recently been put on the market by the Ball Bearing Shock-Absorber Co., New York City, which, although of conventional appearance, is an unusual and interesting construction. Instead of dampening the vibrations of the car, caused by road inequalities, by some sort of friction device the force of the shock is absorbed by the rubber cushions shown in Fig. 7. The device consists of three balls, which run in tapering runways, three in each arm of the shock absorber, the arms being forced together by two rubber cushions, the whole held in place by a bolt and castle nut. When the body springs are compressed the balls run up into the ends of the races and force the two arms apart, thereby compressing the rubber cushions. The greater the spring movement the more the rubber disks are compressed and the more resistance they offer. Adjustment is obtained by screwing down the castle nut, being adjusted more tightly for use on heavier types of vehicles.

Webb Jay Gravity Feed—The Webb Jay Motor Devices Co., Chicago, Ill., has brought out a system which changes pressure to gravity gasoline feed. This system does away with hand and power pumps and leaves the gasoline tank in the rear. The device is a brass can, Fig. 8, 10 inches high and 5 inches in diameter, fitted with three copper pipe connections, one coming from the gasoline tank, or the line, another running to the intake manifold and a third to the carbureter. When the engine is operating the suction of the pistons creates a partial vacuum in the container, because the piston suction acts through the pipe leading from the intake manifold to the container. In order to prevent the piston suction affecting the carbureter there is inserted in the container a flap valve. It is evident that as soon as suction takes place this valve will close, forming two compartments in the container. The float and its mechanism shown is the same in principle as the float of the carbureter. As the level of gasoline rises in the container the float rises and when the container is full the needle valve will shut off the pipe from the intake manifold, thus stopping the suction. The flap valve will now open due to the weight of gasoline above it and this gasoline will drop to the lower chamber and thence to the carbureter. Any water or dirt in the fuel will drop to the bottom of the chamber and may be drained periodically.

Neverleek Top Covering—Neverleek top material, manufactured by the F. S. Carr Co., Boston, Mass., is a surface-coated fabric having the appearance of the finest English grain leather. The surface coating is made from a foundation of new, live rubber, toughened and compounded by secret processes. This is reinforced by a second waterproof inter-lining, combining the surface fabric to the inside lining, thus making it, as the maker claims, doubly waterproof. It is claimed that it will not shrink or blister and will not fade from the effect of exposure to the sun or bad weather.

Perfectite—A waterproofing compound in a semi-solid form called Perfectite is being manufactured by the Price Fire & Water Proofing Co., Poughkeepsie, N. Y. It is thinned with naphtha or gasoline for quick setting and drying, or with linseed oil or any other drying oil, as the user may prefer. It will waterproof tops, clothing, and water buckets, and, in fact, waterproofs anything if properly applied. It should be applied to a dry surface, so as to get the penetration, as its purpose is not to remain upon the surface, but to penetrate, to be absorbed by, the fabric.

Blitzen Carbon Chaser—A carbon remover for vertical motors is being manufactured by the National Auto Specialty Mfg. Co., Tama, Ia. This product, called Blitzen, is a mechanical carbon remover. It comes in the shape of little cubes. The cubes are put into a cylinder through the spark-plug hole, and the motor started. The cubes are soft enough not to mar or scratch the metallic surface of the motor, yet, upon being shaken about within the cylinder, they are of sufficient density to pulverize and break away all carbon incrustations on the surface exposed to their action. The cubes gradually pass out through the exhaust ports of the motor to the manifold, carrying with them all carbon-scale from valves, pistons and cylinder walls. The beauty of this is that it will not stop the motorist from going out, as it can be used while on a tour.